# FORESTRY ABSTRACTS

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# FORESTRY ABSTRACTS

VOLUME 2 1941 NUMBER 4

## THE CONTROL OF SEED ORIGIN IN FORESTRY: METHODS ADOPTED IN SOME EUROPEAN COUNTRIES AND THE U.S.A.

WITHIN the last two decades the control of seed origin in forestry has become more and more recognized as both worthy and capable of practical application on a large scale. Publications testifying to the importance of using seed of a suitable site race are numerous, and have in recent years been summarized and reviewed by Champion [6], Baldwin [1], and others. Attempts to control the provenance of forest seed have varied in kind and degree in different countries and for different tree species. Public and private action has been influenced by such factors as the status of forestry in the national economy; the extent to which planting and sowing have been resorted to; the position regarding imports from abroad; the latitudinal range of, and the extent of altitudinal variation within, the country; and the sensitiveness to climatic change of the species employed. The following is a brief review of the principal methods of origin control that have been adopted in Continental Europe and the U.S.A. Some of these are complementary or even inseparable, and often several methods have been in use in the same country. An account of the position in the British Empire is to be included in a later issue of *Forestry Abstracts*.

1. *Natural regeneration and the use of local seed in artificial regeneration.*—The desire to avoid the risk of using stock that is not adapted to the site has often been a factor in the choice between natural and artificial regeneration and in that between seed purchase and collection of seed within the forest enterprise. In Germany, Hungary, and other European countries, a number of State, communal, and large private forests have their own extractories. The use of local seed is promoted by annual reports on the prospects of seed yields, such as have been published in Sweden, Germany, and Czechoslovakia [18]. Provided that stands are adapted to their site and satisfactory in other respects, their natural regeneration and the use of their seed in local plantation work can be a satisfactory and simple means of controlling provenance.

2. *Origin certification in the trade with seed and plants.*—Such certification may be either the function of a Government or semi-official agency, or in the hands of private individuals. In the first case it may be either voluntary or compulsory. An example of unofficial certification is reported from the U.S.A. by Baldwin and Shirley [2]. Writing in 1936, these authors record that in the United States marked progress in the labelling of seed with the place of origin could be noted during the past decade. 'This', they state, 'has been done by dealers in response to a foreign demand for more complete information, and to requests from well-informed foresters in this country [U.S.A.]. Some seed dealers, both in the East and in the West, have been supplying quite complete data with their seed for nearly 10 years. These include altitude, mean annual rainfall, mean summer temperature, general locality of collection, and in some cases type of soil, &c. Recently a weakening of enthusiasm can be noted, and the data are not as complete as formerly. Many other dealers furnish some information on origin. This is largely taken from foreign seed sources whence their seed comes. In fact, providing the data supplied are reliable, it is usually adequate for an intelligent selection of seed. At the present time [1936], deficiencies in origin records are due more to nurserymen and planters than to failure of seed dealers to supply information'. In another paper, Baldwin and Shirley [3] suggest that unofficial certification should be supplemented and gradually replaced by some voluntary system of control with governmental participation. The advantages of such a control service would include a stimulation of seed export.

Voluntary origin control of an official or semi-official character has been available for a number of years in several continental countries, including Czechoslovakia and Holland. In Czechoslovakia [2, 21] such control was vested in the official forest experiment stations. Extractors and dealers who

availed themselves of this service had to conform to special rules, requiring *inter alia* the submission of (1) a statement from a qualified forester that he knew the stand in which the seed had been collected and that its characteristics were truly described in the accompanying form; (2) copies of the relevant freight bills of lading, in which the weights had to be officially certified; (3) representative samples of cones or seed. These samples were then submitted to a test by which such characters as the number of seeds per kilogram and the weight of one litre of seed were compared with those of samples of known provenance. This comparison served as an additional check on origin. Extractors and dealers had to specify in their price lists the year of collection of the seed, the region and elevation of the parental stand, and other details. Similar rules applied to the official origin certification of nursery plants. The country was divided into three main climatic zones—mountains, hilly country, and southern plains—and it was recommended that seed collected in each region should be used in that region only.

In Holland [19] an association of extractors and nurserymen certified the origin of seed and plants of Scots Pine. This association had a semi-official character, three out of the five members of its committee being appointed by the Ministry of Agriculture. On joining the association, members had to deposit a bond as a guarantee for the fulfilment of their obligations. Seed could be gathered from any tree or stand in Holland, Dutch origin only being certified. Members were allowed to import Pine seed only when such seed could not be obtained in Holland, and even then only subject to special regulations. The danger of perpetuating a poor race through indiscriminate use of home-produced seed was relatively small, since in those regions where the seed was collected practically all genetically inferior or unsuitable stands had already been felled, chiefly during the Great War.

Official seed origin control has been made compulsory for some tree species in Germany (cf. below.)

3. *Provision of seed of suitable provenance by public organizations.*—Good examples of this method may be found in Sweden and Norway. In the former country, the extraction, storage, and distribution of forest seed is handled almost entirely by the State Forest Service and the County Forestry Boards. The seed collected and distributed under the auspices of these authorities bears a precise certificate of origin in which altitude is specified [22]. According to the Forest Conservation Laws of 1923 and 1933, it is one of the duties of the County Forestry Boards to establish supplies of forest seed and plants of controlled origin and suited to the locality [15]. Surplus stocks held by any County Forestry Board may be sold, if of suitable origin, to other County Forestry Boards or to dealers. Seed for use in State forests is collected in the district where it is to be used, and in some cases lots from different parts of the same district are segregated if the localities differ sufficiently in temperature [2]. In Norway an agreement has been made between the Vestland forest societies and State forest authorities on the one hand, and the Vestland Forest Experiment Station on the other, that all seed collection and extraction within the region should be handled by the Experiment Station, which has built an extraction and storage plant for the purpose [17].

4. *Certification of stands of recognized stock and elimination of stands and individuals of inferior quality.*—This is the chief method of provenance control adopted in Germany under the Forest Seed Law (Forstliches Artgesetz) of December, 1934 [10] and subsequent Orders and Regulations by the Ministry of Forests. The following is a summary of the position at the end of 1938 [7, 8, 13].

(i) All matters relating to the application of the Forest Seed Law were handled by Government officers, except that other foresters could be entrusted in certain cases with the inspection of stands, the recognition of which had been applied for. A National Committee for the Forest Seed Law (Reichsausschuss für das Forstliche Artgesetz) composed of representatives of public and private forestry, of science, and of commercial interests, was acting in an advisory capacity to the Ministry of Forests. In order to facilitate the application of this law, all public and private agencies concerned with the production and extraction of seed for sale, the sale of seed, and the commercial production and sale of plants, were organized in a special body (Gruppe der Forstsamen- und Forstpflanzen-betriebe).

The bulk of the expenditure in applying the Forest Seed Law was borne by Government and other agencies whose officers were in charge of its execution, but some of the cost was passed on to the ultimate consumer, who had to pay a levy equal to 1 per cent. of the (controlled) sale price when buying approved seed and nursery stock.

(ii) The recognition of stands was pronounced by the State forest authorities after careful inspection by a Government or other approved forest officer. Application for the recognition of seed-bearing stands was compulsory for State forest districts and voluntary for other forests, except stands of European Larch and Douglas Fir, for which application was required in all cases. Furthermore, the authorities could enforce recognition for other species, if it was considered desirable.

The principles on which the recognition of stands had to be based were laid down in considerable detail. To facilitate the practical execution of the work these principles were stated in as definite terms as possible, even in cases where no scientific conclusion had been arrived at. *Within the natural range of distribution of a species*, as a rule only those stands were to be recognized which in all likelihood were indigenous to their particular region and to approximately the same range of elevation. Proof for this had to be secured historically. Moreover the stands had to be free from such defects as made their propagation undesirable in spite of their being indigenous. Stands that were not indigenous to their site in the above sense were only to be recognized if judged definitely superior to the indigenous race, or if there was a shortage of indigenous stands. *Outside the natural range of distribution of a species* only those stands were eligible which showed the best possible development that could be expected under the given conditions of site and treatment. In all cases great care was to be exercised in distinguishing between the phenotype and the genotype of a stand when judging its genetic value. Thus recognition was to be refused when the passable appearance of a stand could be assumed to be due entirely to favourable environment. Conversely, stands were not to be precluded from recognition merely because they had suffered from such environmental conditions or accidents as even stands of the highest genetic value would have been unable to resist. Only stands that had reached the age of reproduction were to be certified. Stands, even though satisfactory as such, were not to be recognized as long as genetically inferior stands or trees capable of cross-pollinizing the former were situated within 300 metres of their boundary. In recognizing a stand the officer was to state in what regions and approximate elevations its seed should *preferably* be used. For this purpose, Germany[1] was divided into eleven crop areas (Anbaugebiete) and into elevation ranges that were specified approximately for the various parts of the country. As a rule, recognition was to be pronounced only in respect of the crop area in which the parental stand was situated, but certain seed could be certified for use outside its own crop area, e.g. Douglas Fir seed for the whole of Germany, while conversely a narrower region was to be specified where required. Similar provisions applied to the specification of the elevation range. Finally, certain non-genetic factors were to be taken into account before recognizing a stand, such as its size, its position in relation to other recognized stands, and other conditions affecting the economy and ease of seed production. Individual trees were to be recognized in exceptional cases only.

Apart from the general principles as outlined above, special rules were laid down for the most important tree species of Germany. Those for Scots Pine were particularly detailed, ten indigenous site races being distinguished. The rules for the various species mentioned certain diseases, which precluded stands from certification, e.g. *Rhabdocline* and *Adelopus* in Douglas Fir.

Recognized stands of the same species and the same hereditary quality situated within the same State forest district or in a forest belonging to the same person or corporate body, were grouped into recognition units (Anerkennungseinheiten), each with a recognition sign showing district of the stand, serial number of the recognition unit, and the regions and elevation ranges in which the seed should preferably be employed. All the recognized stands had to be clearly demarcated in nature. The authorities had power to fix the earliest date for harvesting the seed of the various species, and to regulate the harvest in every other way deemed desirable. They were also empowered to prohibit the felling of stands of special genetic value. Detailed rules were laid down for the organization of seed harvests. Collectors had to have special certificates and were subjected to strict control.

(iii) All transport and sale of seed and cones from recognized stands had to be performed under seal. On leaving the producer these goods had to be packed separately according to their recognition units. In extractories and nurseries they had to be stored and employed separately, at least according to the crop areas and elevation ranges for which they had been recommended, and preferably according to narrower subdivisions down to the recognition unit.

[1] Including Austria and the Sudeten country, although the Forest Seed Law was valid only for Germany proper.

(iv) In the case of Scots Pine and European Larch it was forbidden to use the seed of stands that had not been approved. This prohibition was practicable owing to the fact that the Chief Forest Seed Certification Committee (Hauptausschuss für forstliche Saatgutanerkennung) had recognized a sufficient number of stands of these species to allow the usual national seed requirements to be satisfied entirely from these stands. This committee had been initiated in 1925 [2] and its principles of stand certification had served as a basis for the regulations which, later on, had been incorporated in the Forest Seed Law.

(v) Stands of inferior hereditary quality that endanger neighbouring stands suitable for recognition, were to be eliminated as soon as possible, provided that this was admissible on silvicultural, management, and economic grounds. Other stands of inferior genotype were to be eliminated thereafter.

(vi) Infractions of the Orders and Regulations issued under the Forest Seed Law were punishable by fine up to RM. 10,000 or by imprisonment.

As may be seen from this summary, the control of provenance under the German Forest Seed Law is both drastic and detailed. This is largely due to the fact that the consequences of indiscriminate use of forest seed have been most serious in Germany, where until recently regeneration was to about 95 per cent. artificial (estimate from [20], p. 189).

In Denmark, where the certification of the origin of forest seed and seedlings is entirely voluntary, the Seed Committee of the Danish Forest Society makes itself responsible for the selection of suitable parental stands [4, 12]. The seed of such stands is supplied by certain public and private agencies. It is sold under seal and bears a guarantee specifying the stand from which it has been collected. A percentage fee is levied on the sales to defray the expenditure of certification. The parental stand is also specified for seedlings raised from recognized seed. This scheme has been in operation since 1938, and so far there has been a good demand for seed of approved origin [5].

5. *Restrictions on the use of seed of unknown source.* Mention has already been made of the prohibition, under the German Forest Seed Law, against the use of Scots Pine and European Larch seed other than of recognized source. In Switzerland [11], the 'Prescriptions' of December, 1932, assured the use of seed of known source for afforestation work under federal subsidies. This was of benefit mainly to protection forestry. Since June 1939, it is the policy of the U.S. Department of Agriculture to use only forest seed of known locality of origin and nursery stock grown from such seed. As roughly 95 per cent. of all forest planting is carried out by this Department, or by agencies co-operating with it, this can be regarded as a very important step towards the genetic improvement of American forests. The new policy, as stated in the memorandum of the Seed Policy Committee to the Secretary of Agriculture [9], further stipulates that (1) reliable evidence is to be demanded from suppliers of seed and plants, indicating that the stock offered is of the source represented; (2) records are to be required of the origin of stock used in planting; (3) as a rule, local seed from natural stands is to be used whenever available; (4) when local seed is not available, seed from a region having as nearly as possible the same environmental conditions is to be used; and (5) organizations and individuals undertaking plantation work, the expense of which is borne wholly or partly by the Federal Government, are to be urged to adhere to this seed policy.

6. *Restriction and regulation of imports.*—In Sweden the poor results obtained from Central European seed led to the imposition of taxes on all imported forest seed, and since 1910 imported seed of Pine and Spruce is required by law to be dyed at the customs with eosin [14]. In Germany, imports of seed from abroad have been subject to several sets of import prohibitions affecting the seed and plants of a number of tree species. In recent years these prohibitions have been almost superfluous since the currency policy of Germany practically stopped the import of seed and plants. The importation of Douglas Fir seed was a special case; since 1938, such seed has been imported by the Ministry of Forests, and by nobody else. The seed was harvested by an American extractory in specified forest regions and an American officer paid by Germany exercised such supervision as was deemed necessary [13]. Since the winter of 1927–8 the Vestland Forest Experiment Station has been responsible for supplying the whole of Norway with imported seed [16]. Various restrictions and regulations regarding forest seed imports have also been in force in other European countries (e.g. Holland, cf. above). In the U.S.A., Federal Quarantine No. 37 provides a basis for requiring origin data [2].

## THE CONTROL OF SEED ORIGIN IN FORESTRY

Many proposals have been made for some kind of organization which would facilitate provenance control on an international scale. This matter has been on the agenda of several international forestry congresses, but so far none of the schemes suggested have been put into practice.

## LITERATURE CITED


[1] BALDWIN, H. I. The importance of the origin of forest seeds. *Emp. For. J.* 12, 1933 (198–210).
[2] BALDWIN, H. I., and SHIRLEY, H. L. Forest seed control. *J. For.* 34, 1936 (653–63).
[3] —— —— A forest seed program for the United States. *J. For.* 34, 1936 (766–70).
[4] BORNEBUSCH, C. H. Meddelelse fra Frøudvalget. [Communication from the Seed Committee.] *Dansk Skovforen. Tidsskr.* 23, 1938 (279–97). [Da.]
[5] —— Meddelelser fra Frøudvalget. [Communications from the Seed Committee.] *Dansk Skovforen. Tidsskr.* 24, 1939 (401–9). [Da.]
[6] CHAMPION, H. G. The importance of the origin of seed used in forestry. *Indian For. Rec.* 17 (5), 1933. pp. 76.
[7] Dritte Verordnung zur Durchführung des Forstlichen Artgesetzes. Vom 22. November 1938. [Third Order regarding the execution of the Forest Seed Law. 22nd November, 1938.] *Dtsch. Forstw.* 20, 1938 (1224–6). [G.]
[8] Erste Anordnung zur Durchführung des Forstlichen Artgesetzes. [First Regulation regarding the execution of the Forest Seed Law.] *Dtsch. Forstw.* 20, 1938 (1261–71). [G.]
[9] Forest seed policy of U.S. Department of Agriculture. *J. For.* 37, 1939 (820–1).
[10] Forstliches Artgesetz. Vom 13. Dezember, 1934. [Forest Seed Law. 13th December, 1934.] *Dtsch. Forstw.* 16, 1934 (1098). [G.]
[11] Guide pour le choix et la préparation de semences forestières de qualité irreprochable. [Guide to the selection and preparation of forest tree seed of irreproachable quality.] *J. for. suisse* 90, 1939 (260–7). [F.] [Cf. *For. Abs.* 1, 1939–40 (256).]
[12] Henvendelse fra Frøudvalget. [Appeal by the Seed Committee (for information on suitable seed stands).] *Dansk Skovforen. Tidsskr.* 22, 1937 (71–3). [Da.]
[13] LANGNER. Die Durchführung des Forstlichen Artgesetzes. [The execution of the Forest Seed Law.] *Dtsch. Forstw.* 20, 1938 (1277–85, 1288). [G.]
[14] SCHOTTE, G. Om färgning af skogsfrö i syfte att utmärka utländsk vara. [On dyeing forest seeds to distinguish foreign goods.] *Medd. Statens Skogsförsöksanst.* 7, 1910 (69–90). [Sw.]
[15] Skogsvårdslagar år 1933. [Forest Conservation Laws, 1933.] Länsjägmästares Förening, Karlstad. 1934. pp. 47. [Sw.]
[16] SMITT, A. Proveniensspørsmålet. [The question of provenance.] *Tidsskr. Skogbr.* 37, 1929 (143–53, 275–86, 455–63). [Nor.]
[17] —— Vestlandets forstlige Forsøksstasjon og dens arbeidsopgaver. [The Vestland Forest Experiment Station and its tasks.] *Tidsskr. Skogbr.* 41, 1933 (3–13). [Nor.]
[18] TSCHERMAK, L. Wege zur Sicherung geeigneter Herkünfte beim Bezuge des forstlichen Saatgutes. [Means for assuring suitable provenance of forest seed.] *Actes 2e Congrès International de Sylviculture, Budapest*, 1936. Vol. 3 (263–74). [G.f.]
[19] VAN DISSEL, E. D. Le contrôle de l'origine des graines et des plantes de pin sylvestre en Hollande. [The control of the origin of seed and plants of Scots Pine in Holland.] *Actes 2e Congrès International de Sylviculture, Budapest*, 1936. Vol. 3 (196–8). [F.]
[20] VANSELOW, K. Natürliche Verjüngung im Wirtschaftswald. [Natural regeneration in the production forest.] Neudamm. 1931. pp. 280. [G.]
[21] VINCENT, G. Evidenzführung der forstlichen Samen und Pflanzen nach ihrer Herkunft. [Provenance control of forest seed and plants.] *Proc. int. Congr. For. Exp. Sta., Stockholm*, 1929 (343–7). [G.]
[22] WIBECK, E. Die forstliche Saatgutversorgung Schwedens und einschlägige Probleme. [The forest seed supply of Sweden and related problems.] *Proc. int. Congr. For. Exp. Sta., Stockholm*, 1929 (412–25). [G.]

# ABSTRACT SECTION

NOTE.—A capital letter in square brackets following the reference denotes the language in which the paper is written. A small letter denotes a summary in another or the same language, e.g. [G.e.]—German, with English summary. English [E.] is only indicated for papers published in journals usually written in foreign languages.

The term "billion" used in papers originating in North America means a thousand million.

## 0. GENERAL FORESTRY

### 01. NOMENCLATURE. BIBLIOGRAPHY

01 (68). **A standard nomenclature for South African grown timbers.** *J. S. Afr. For. Ass.* No. 5, 1940 (75–80). [E. Afr.]

01 (7). MUNNS, E. N. **A selected bibliography of North American forestry.** Vols. I and II. *Misc. Publ. U.S. Dep. Agric.* No. 364, 1940. pp. 1142.

01 : 31.2 : 31.8 : 11. **Publications of U.S. Forest Products Laboratory, Madison, Wisconsin, on the relation of growth conditions to wood quality.** (1924–1939). Forest Products Research Laboratory, Madison, Wis. 1939 [?]. pp. 7.

01 : 33.36. **List of publications on wood preservation.** Forest Products Laboratory, Madison, Wis. No. *R*704, 1940. pp. 28. P.R.

01 : 33.36. **List of publications on wood finishing subjects.** Forest Products Laboratory, Madison, Wis. No. *R*454, 1940. pp. 14. P.R.

### 02. LISTS OF VERNACULAR NAMES

02 (68). WICHT, C. L. Afrikaanse bosboomname. **[Afrikaans names of forest trees.]** *J. S. Afr. For. Ass.* No. 5, 1940 (41–61). [Afr.]

02 (91.1). KEITH, H. G. **Additions to the preliminary list of North Borneo plant names (*North Borneo Forest Records* No. 2).** Forest Department, Sandakan, N. Borneo. 1940. pp. 8–12.

### 05.3. *Annual Reports*

05.3 (485). SWEDEN. Domänverket år 1939 av Kungl. Domänstyrelsen. **[Report on work on the Crown Lands, 1939, by the Royal Crown Lands Board.]** P. A. Norstedt & Söner, Stockholm. 1940. pp. 130. [Sw.]

05.3 : 3 (97). **Report of the Colonial Forest Resources Development Department, 1st April, 1939 to 31st March, 1940.** 1940. pp. 2. P.R.

### 06. SOCIETIES. PROPAGANDA

06 (73). HOSMER, R. S. **The Society of American Foresters: An historical summary.** *J. For.* 38, 1940 (837–54).

06 : 90. ROSS, C. R. **Some aspects of forestry public relations in the Southern Appalachian backhills.** *J. For.* 38, 1940 (916–24). [S. Carolina Extension Service.]

### 07. EDUCATION AND RESEARCH

07 (73). **Degrees in forestry: final report of the Committee on Degrees in Forestry, Division of Education, Society of American Foresters.** *J. For.* 38, 1940 (781–9).

07 : 81 : 84. SCHREINER, E. J. **Research organization and research cost accounts.** *J. For.* 38, 1940 (909–15). [Northeastern Forest Exp. Sta.]

07 (71.4). RAY, R. G. La station expérimentale forestière de Valcartier. **[The Valcartier Forest Experiment Station.]** *La Forêt Québécoise* 2 (10), 1940 (29–40).

07 (73). **Forest Products Laboratory research programme 1940-1941.** Forest Products Laboratory, Madison, Wis. 1940. pp. v + 92 + 3. P.R.

### 09.1. *Forest History*

09.1 : 11.6 : 46 (494). HESS, E. Zur Geschichte des Waldes in Oberhasli (Berner Oberland). **[On the history of the forests of Oberhasli (Bernese Oberland).]** *Veröffentl. geobot. Inst. Rübel* No. 16, 1940. pp. 136. [G.] Biol. Abs. 14 (15342).

### 09.4. *Forest Statistics*

09.4 (47.1). ILVESSALO, Y. Suomen metsävarat vv. 1936–1938: Selostus II: n valtakunnan

metsien arvioinnin päätuloksista. **[The forest resources of Finland in 1936-1938: A summary of the main results of the second National Survey of the forests.]** *Comm. Inst. for. Fenn.* 28 (6), 1939–40, pp. 51 [Fi.]; (7), 1939–40, pp. 48. [E.]

Cf. *For. Abs.* 2 (182).

09.4 : 94.1 (47.1). LINNAMIES, O. Suomen maalaiskuntien metsät. **[The village community forests of Finland.]** *Comm. Inst. for. Fenn.* 28 (2), 1939–40. pp. 56. [Fi.g.]

The data presented mostly refer to the beginning of 1938. The 537 village communities of Finland owned a total of 365,551 ha. of land, of which 302,652 ha. (82·8 per cent.) was forest. The average land and forest area per community thus amounted to 681 and 564 ha., respectively. 316 of the communities, representing 71·1 per cent. of the total forest area, were members of co-operative forest societies, and 21 communities, representing 11·7 per cent. of the total forest area, employed a forester of their own. 94 communities had prepared, during 1928–38, a working plan for the whole or for part of their woodlands, the area covered by such plans amounting to 79,500 ha. or 26·3 per cent. of the total forest area of these communities.

09.4 : 98.1 (47.1). HARTIKAINEN, E. Suomen teollisuuden polttoaineen käyttö v. 1936. **[Industrial fuel consumption in Finland, 1936.]** *Comm. Inst. for. Fenn.* 27 (5), 1938–9. pp. 64. [Fi.g.]

This investigation forms part of the surveys carried out by the Forestry Research Institute at intervals of three years since 1927. The rapid industrial development of Finland during 1933–6 was reflected in increased industrial fuel consumption ; expressed in terms of heating power, the increase since 1933 amounted to about 29 per cent. for all fuels, 19 per cent. for native fuels, and 46 per cent. for imported ones, chiefly mineral coal. For the first time, coal had become the most important single fuel. In 1936 the waste materials of the timber industry occupied the second, and firewood, as in 1933, the third place. Since 1933 the price of firewood had increased by about ten and that of coal by about 15 per cent., while the prices of wood waste had remained fairly constant. On the basis of heating power, these waste materials together with peat were relatively the cheapest fuels; firewood was about 8 per cent. (as against 12 per cent. in 1933) dearer than coal, while charcoal and liquid fuels remained among the most expensive fuels of industry.

09.4 : 98.1 : 33.0 : 33.32 : 12.2 (47.1). HARTIKAINEN, E. Vientipaperipuun hankinta suomesta ja kuusen käyttö teollisuutemme raaka-aineena. **[The production of export pulpwood in Finland and the use of Spruce as a raw material in the Finnish timber industry.]** *Comm. Inst. for. Fenn.* 28 (4), 1939–40. pp. 29. [Fi.g.]

During 1933–8 Germany, France, and Holland absorbed 47·6, 20·3, and 12·1 per cent., respectively, of the Finnish pulpwood exports. Great Britain bought 3·1 per cent. of the exports and was the sixth largest customer. During this period, the U.S.S.R. supplied 41·8 per cent. of the total pulpwood exports from European countries, while the corresponding figure for Finland, the second largest exporter, was 19·2 per cent. European exports within this period reached their maximum in 1934 when they amounted to 7·4 million solid cu. m. 62·1, 10·0, 7·4, and 4·9 per cent. of all European exports during 1933–8 were bought by Germany, France, Holland and Great Britain, respectively.

Export pulpwood is produced in Finland chiefly in the coastal districts, and is usually shipped from the harbour nearest to its site of origin. As nearly as could be ascertained 74 independent purchasers and 186 agents participated on an average in the buying of pulpwood in Finland during 1934–7, indicating that deliveries were not very centralized. Owing to the increased demand, in recent years, for Spruce pulpwood, there has been a tendency to use Spruce timber of sawmill size in pulp manufacture. During 1922–37 Spruce accounted for 22 to 30 per cent. of all timber handled by the sawmills, the percentage being highest (over 40 per cent.) in some coastal districts with considerable Spruce forest resources. It is thought that in some of these districts the sawmill industry is still in the position to cede considerable amounts of Spruce timber to the pulp and paper industry.

09.4 : 98.3 : 33.0 : 33.32 : 12.2 (47.1 : 48). PÖNTYNEN, V. Kuusipaperipuiden hinnoista pohjoismaissa. **[On Spruce pulpwood prices in Finland and Scandinavia.]** *Comm. Inst. for. Fenn.* 28 (5), 1939–40. pp. 79. [Fi.g.]

The investigation covers in the main the felling periods 1934–5, 1935–6, and 1936–7,

and comprises two parts dealing, respectively, with prices of Spruce pulpwood consumed by the home industries and with those of export pulpwood. The former were considerably lower in the northern half of Finland than in the southern half, and within the southern half they were somewhat lower in the east than in the west. This is explained chiefly by the relative dearth of labour in the north, by the higher cost of transport of *finished export products* that industries situated in the south-east, and still more those in the north, have to bear, and by the more intense competition with the export trade in the coastal districts. During 1934–7, 53 per cent. of the pulpwood consumed by the Finnish industries was sold standing, the remaining 47 per cent. being delivered in a prepared condition (cut, split and roughly barked) at the roadside or other points from which further transportation was arranged by the buyer. The proportion of pulpwood delivered in this manner as against material that was sold standing was relatively high in the northern half of Finland where a large part of the wood was supplied by the State Forest Administration, which generally avoided selling pulpwood standing. Analyses of prices of pulpwood delivered to factory allowed of assigning 39 to 44 per cent. of such prices to the cost of standing timber in the northern half of Finland, and 48 to 61 per cent. in southern Finland. The data obtained for Sweden and Norway were incomplete and only partly comparable with the Finnish statistics. With regard to Sweden, it appears that prices for pulpwood delivered to factory were higher than those paid in comparable regions in (southern) Finland in 1934–5 and 1935–6, but not in 1936–7, while there was little difference in the price paid for standing timber in the two countries. In Norway, on the other hand, prices for both standing material and for pulpwood delivered to factory were higher than in Finland, while the ratio of prices at factory to prices of standing timber was roughly the same as in Finland.

The f.o.b. prices of *export pulpwood* in Finland were consistently higher than the prices at factory paid by the home industry. The prices of standing timber were also higher in the case of export pulpwood, especially in 1936–7. Export pulpwood was procured chiefly in the coastal districts, while the home industries were supplied mainly from the interior. Transport to factory cost less than to the nearest harbour for export, as the home industries benefited by the floating facilities of the interior, while the latter, though generally for shorter distances, was usually by road or rail. In Sweden and Norway export of pulpwood is far less developed than in Finland. The Swedish home industry generally paid higher prices at factory than those secured for export pulpwood delivered f.o.b. This industry has a very strong hold over the market in all parts of the country, and woodland owners prefer to sell to home factories rather than to export agents even when the latter offer somewhat more attractive prices. In Norway the strong organization of woodland owners has raised pulpwood prices so much that they are unattractive to exporters.

09.4 (485). BUNDY, O. Beräkning av skogsavkastningen i en del län i södra och mellersta Sverige. **[Estimated forest yield in certain counties in southern and central Sweden.]** *Skogsägaren* 16, 1940 (164–7). [Sw.]

Tables are given of the estimated forest yields for 1937 of 12 counties in southern and central Sweden. Figures are presented for (*a*) the percentage distribution of the fellings over the various categories of wood, together with the average prices for the preceding 5 years; (*b*) fellings per ha. of productive forest land, compared with data on increment and growing stock as calculated in the State Forest Survey; and (*c*) the value yield per ha. of productive forest land.

09.4 : 82 (485). NYSTRÖM, B. Arbetsförtjänsterna i skogarna 1922–1940. **[Wages of forest workers, 1922-1940.]** *Skogen* 27, 1940 (289–90). [Sw.]

09.4 : 98.3 (485). 1939 utrikeshandeln: Exporten av skogsprodukter. **[Foreign trade of Sweden, 1939: Export of forest products.]** *Skogen* 17, 1940 (349). [Sw.]

Figures are given for exports of the various categories of manufactured and non-manufactured wood, pulp, pulp and paper products, and several minor wood products.

09.4 (498). FLORESCU, I. Note asupra pădurilor României desmembrată. **[Notes on the forests of the ceded portions of Rumania.]** *Rev. Pădurilor* 52, 1940 (668–71). [Rum.f.]

09.4 (75.6). CRUIKSHANK, J. W. **Forest resources of the Piedmont region of North**

**Carolina.** *For. Surv. Release Appal. For. Exp. Sta.* No. 6, 1940. pp. 55.

There are nearly 5 million acres of forests in this region, 85 per cent. of which are in farm ownership. Shortleaf Pine is the most abundant species and 72 per cent. of the forest area is of Pine types, 24 per cent. upland hardwoods and 4 per cent. bottom-land hardwoods. Seven-tenths of the saw-timber volume of 11 billion bd. ft. is Pine. Increment totalled 709 million bd. ft. in 1937 while the total commodity drain was 886 million bd. ft. of saw timber, the over-cut taking place in Pine stands.

09.4 : 35 : 98.1 (76.8 : 73). ALLRED, C. E., and FITZGERALD, F. M. **Market channels for forest products, Tennessee and United States.** *Rur. Res. Ser. Mon. Tenn. agric. Exp. Sta.* No. 95, 1939. pp. 37.

09.4 : 98.1 (76.8 : 73). ALLRED, C. E., and FITZGERALD, F. M. **Forest production areas, Tennessee and United States.** *Rur. Res. Ser. Mon. Tenn. agric. Exp. Sta.* No. 93, 1939. pp. 54.

## 09.7. *Monographs of Individual Forest Regions*

09.7 : 09.4 (498). DEMETRESCU, I. C. Basarabia şi îngemânarea sa in cuprinsul românesc de viețuire. **[Bessarabia in the 'Lebensraum' of Rumania.]** *Rev. Pădurilor* 52, 1940 (576–90). [Rum.f.]

The paucity of forest resources of Bessarabia and the past efforts of the Rumanian Government to improve the timber position are discussed. Altogether 29,000 ha. had been afforested up to 1939.

09.7 : 12.2 (54.5). AHMAD, M. S. **Karnpur and Bindraban Bamboo forests (addendum and corrigendum).** *Indian For.* 66, 1940 (671–2).

Cf. *For. Abs.* 2 (112).

09.7 : 86 (588). HOWARD, S. H. **Note on a tour of inspection of Baluchistan.** Govt. of India Press, Simla. 1940. pp. 18.

Report on the present situation in regard to the forests of Baluchistan, excepting those in the plains, and proposals for future action to improve forest conditions.

09.7 (67.6). FREEMAN, R. W. T. **The forestry problem in the Eastern Province of Uganda.** *Emp. For. J.* 19, 1940 (274–81).

The area of natural forest in this region is small and is confined to the mountain tops and to a narrow strip along the Nile. Over parts of the countryside a fire-resistant tree-savanna growth is found, although its area has been greatly reduced by the demand for fuelwood and the use of the soil for cotton growing. The Crown forest area at present totals 2,163·5 sq. miles, including 240 sq. miles that have been reserved in a sleeping-sickness area for the growing of *Chlorophora excelsa*, and 1,500 sq. miles of savanna reserved as a protection against the approach of desert conditions. As the natural forest is rapidly disappearing the problem of supplying the natives with their future requirements in poles and fuelwood becomes more acute. It is concluded that the only possible solution is individual or community planting, which will be possible only when the native is assured of security in land tenure.

Among the species suggested as suitable for planting in this region are *Markhamia platycalyx* and *Melia azedarach* for hut poles, and Eucalypts, Black Wattle, and *Cassia siamea* (on the plains) for fuelwood.

09.7 (67.6). EGGELING, W. J. **Budongo—an East African Mahogany forest.** *Emp. For. J.* 19, 1940 (179–96).

The Budongo forest in Uganda is described. In the introductory section information is given regarding situation, area, topography, climate, demarcation and survey, rights and privileges, working plan, permissible yields and actual fellings, history of exploitation, methods of extraction, markets and marketable timbers, forest fees and labour costs. A second section describes succession, structure and composition, and gives figures of stem counts in different types of forest. In the final section the regeneration of Mahogany [*Khaya anthotheca* and *Entandrophragma* spp.], *Chlorophora* [*excelsa*] and *Maesopsis* [*eminii*] is discussed. In the case of Mahogany, most success has been achieved by the line-group planting of large stripped plants. *Author's summary.*

09.7 (68). WIMBUSH, S. H. **Some notes on South African forestry (made during a visit to South Africa in 1939).** *Emp. For. J.* 19, 1940 (197–218).

A brief introduction outlining the scale of forestry operations in South Africa is followed by more detailed notes on (i) forestry in plantations, including management, silviculture,

and exploitation; and (ii) the management of indigenous forests, with special reference to regeneration and exploitation under the working plan for Deepwalls Forest.

09.7 (729.0). BEARD, J. A. **The woodlands of Bermuda.** *Emp. For. J.* 19, 1940 (258–63).

A short account is given of the situation, climate, topography, soils, and woodland communities of the Bermudas. Owing to the dense population no entirely natural woodlands are left in the islands. There are only seven native tree species, three of which are endemic, but a number of exotics, originally introduced as ornamental or fruit trees, are now thoroughly naturalized. The native Cedar (*Juniperus bermudiana*) is the only tree now utilized for timber. Its wood is aromatic and very durable, and was formerly used for all kinds of woodwork, including shipbuilding. The tree is always short-boled, branchy and of small size in the log; consequently its timber has been replaced in most fields by cheap imported lumber from North America, though it still commands a good price for certain kinds of joinery, for furniture and wood-carving, and to some extent, as firewood. The tree regenerates freely and is in no danger of being overcut. No attempt is made to grow timber trees in Bermuda; Cedar is allowed to come up naturally, and any plantings of other trees are made for purely ornamental purposes.

09.7 : 3 : 98.1 (91). DESCH, H. E. **A tour in the Malay Archipelago.** *Timb. Tr. J.* 154, 1940 (82–3, 115–6); 156, 1941 (41, 72).

Chiefly notes on the sawmill industries of Sarawak, British North Borneo, and the Philippines. Extraction and sawmilling conditions in these territories are compared with those of Malaya.

09.7 : 09.4 (944). **Forestry and timber resources of New South Wales.** *Aust. Timb. J.* 6, 1940 (287, 317–8, 369, 379–80, 383; 428, 435–7; 485, 489–90, 512; 536–7, 552, 554).

# 1. FUNDAMENTAL NATURAL LAWS OF THE FOREST

## 11.1. *Atmosphere*

### 11.12. Pressure and Movement

11.12 : 07.7 : 43. FONS, W. L. **An Eiffel type wind tunnel for forest research.** *J. For.* 38, 1940 (881–4). [California Forest & Range Exp. Sta.]

Description of the construction and operation of a low-velocity wind tunnel, which is being used in the study of fire behaviour under conditions of controlled wind. The tunnel has a total length of 48 ft. and consists of three sections: the entrance, the test section and the exit.

## 11.4. *Soil*

### 11.41. Soil Physics. Profiles

11.41 : 24.4. GRITSENKO, I. F. **The effect of various windbreaks on soil moisture.** *Pedology* 1940 (3), (24–39). [R.g.] S. & F. 4 (45).

The effect of windbreaks in increasing soil moisture was particularly noticeable within 50–150 m. of the strips. The effect varies with the season, attaining its maximum in spring.

11.41 : 11.42 : 42.1. LUTZ, H. J. **Disturbance of forest soil resulting from the uprooting of trees.** *Bull. Yale Univ. Sch. For.* No. 45, 1940. pp. 37 + plates.

An investigation was made of the effects of disturbance by windthrow on the properties of New Hampshire brown podzolic and podzol soils. In disturbed soils the horizons were frequently very irregular and material from the upper and lower horizons was often rather intimately mixed, thus favouring the decomposition and incorporation of organic debris and the establishment of reproduction. In some places almost every mound bore either young seedlings or mature trees. Mixture of the horizons caused reversion to earlier stages in soil genesis, thus disturbed podzols showed changes in the direction of the brown podzolic type. Changes in the disturbed soil that are regarded as favourable from the ecological point of view were increases in pore volume of the upper 10 cm. of soil, in air capacity, and in infiltration rate, a higher proportion of heavy minerals (sp. gr. over 2·68) that may afford plant nutrients, a higher buffer capacity, and higher percentage base saturation. Relatively unimportant differences in the disturbed soils were a slightly lower volume weight, a slightly

higher pH and coarser texture due to the presence of material from the lower horizons. No significant differences were found between disturbed and undisturbed soils in water-holding capacity, moisture equivalent, total N, organic C, C/N ratios, readily soluble P, exchangeable bases, exchangeable H, and total exchange capacity. A concurrent investigation of soil temperatures in artificial mounds comparable to those made by uprooted trees showed that maximum surface soil temperatures varied greatly with aspect, the mean difference of the maxima for northern and southern slopes being as much as about 16° F. in one instance. Hence with generally high soil temperatures and low soil moisture the northern and eastern slopes, and with converse conditions the southern and western slopes should present the most favourable conditions for reproduction.

11.41 : 97.1 : 6. TURNER, L. M. **Forest-land use and the soil profile.** *Proc. Soil Sci. Soc. Amer.* 4, 1939 (343–5). [Southern Forest Exp. Sta.] H.S.B.

Evidence from published studies shows that both the composition and the rate of growth of forest can be related to soil characteristics. Before the framing of land-use programmes, special attention should be given to any possible relationships between soil characteristics and the comparative productivity of the soil for various kinds of produce.

## 11.42. Soil Chemistry

11.42. VAGI, I. Az erdei talaj televény-és könnyen oldódó $P_2O_5$-tartalmának az évi változása. [**Annual changes in the humus- and readily soluble $P_2O_5$-content of forest soils.**] *Erdész. Lap.* 79, 1940 (562–8). [Hu. g.f.e.]

The changes observed were negligible and irregular.

11.42 : 11.41 : 11.47 : 11.48–9. AALTONEN, V. T. Zur Stratigraphie des Podsolprofils, besonders vom Standpunkt der Bodenfruchtbarkeit. II. [**On the stratigraphy of the podzol profile, with special reference to soil fertility. II.**] *Comm. Inst. for. Fenn.* 27 (4), 1938–9. pp. 133. [G.g.e.fi.]

The object of this investigation was to throw some light on the development of the podzol profile in ageing soils of fresh moss forests. As in earlier studies on dry sandy soils, it was found that inorganic colloids are precipitated in young soils in deeper layers than in old ones; that iron is precipitated uppermost, aluminium next below, and silicic acid deepest of all; and that in comparison with aluminium, iron is precipitated more abundantly in young than in old soils. Even slight differences in the particle-size distribution affected podzolization; and clay soils (Tonböden) were scarcely podzolized at all. Even in the young soils the chemical composition was changed by podzolization to a depth of 50–60 cm. and the young soils were somewhat more acid than the old ones. The investigation will be continued in other forest types.

11.42 : 12.19.2 : 12.2. REMEZOV, N. P. **Conditions of nitrogen nutrition in Pine forests.** *Sovetsk. Bot.* 1938 (6), (34–51). [R.] [Bryansk Forestry Institute.] K.

From investigations near Bryansk it appears that in stands with a ground vegetation of mosses and Bilberry N-nutrition consists almost exclusively of ammonium salts, while in those with an undergrowth of shrubs and Wood Sorrel nitrate salts are also absorbed to some extent. Ammonification, and especially nitrification, are intensified by clear-cutting.

11.42 : 12.2. SPURR, S. H. **The influence of two *Juniperus* species on soil reaction.** *Soil Sci.* 50, 1940 (289–94). O.R.E.

Both *Juniperus virginiana* and *J. communis* alter the pH of old field soils in the vicinity of New Haven. The first species raises the pH of the upper part of the mineral soil and lowers it at a depth of 6 in. *J. communis*, on the other hand, lowers the pH at both depths. Tentatively, it may be concluded that the addition of litter is a highly important factor influencing the pH of the upper part of mineral soil, and withdrawal of soluble substances by the roots appears to be of similar importance at a 6-in. depth. *Author's summary.*

## 11.44. Surface Humus. Litter

11.44 : 11.43 : 11.42. PLICE, M. J. **The bionomics of some forest soils.** *Proc. Soil Sci. Soc. Amer.* 4, 1939 (346–52). [Oklahoma Agricultural Exp. Sta.] H.S.B.

Neither counts of bacteria and fungi nor measurements of $CO_2$ in decomposition tests satisfactorily explain the very rapid decomposition of mor humus in the southern United States and the consequent absence or poor development of the H horizon characteristic

of the northern forests. In view of this and of the fact that insolation is much greater in the south, it is suggested that eremacausis or autoxidation may be an important factor in humus decomposition in this region.

A theory of the formation of the mull type of humus is presented. Mull is produced under anaerobic conditions caused by high moisture and a strongly reducing environment, which result in decarboxylation of acidic humus substances and condensation of polyhydroxy (especially phenolic) groups. The organic matter of mull contains more total carbon, less hydrogen and oxygen, and is less acid and more stable and inactive than that of mor. It is believed that faunal action, including that of earthworms, is unnecessary in the process of mull formation, as large areas of mull soils are almost devoid of earthworms or other soil fauna. Most effect in the process is attributed to the triturating and mixing actions of freezing and thawing and wetting and drying, which should bring about the fine division of organic matter and its incorporation into the mineral soil. It is further believed that if, as is commonly claimed, mulls are more fertile than mors, they derive their superiority from their much better physical condition rather than from differences in moisture or nutrients.

## 11.46. Relationship of Plants to the Soil

11.46 : 12.2 : 11.48–9. DAVIS, P. W. **Preliminary note on Nilambur soils with special reference to their suitability for Teak.** *Indian For.* 66, 1940 (658–71).

Teak plantations in Malabar, on soils that had borne good mixed forest containing fine Teak and with all the indications of a good site for this species, have often been disappointing, tending to stagnate after a time or even to be invaded by more tolerant species that replace the Teak. The soil is of gneissic origin, and the climate, with alternating periods of heavy rain and great heat and drought, presents conditions favourable for the formation of laterite *in situ* on exposure or through any act that reduces the humus content of the soil. The theory of laterite formation is discussed and the author points out that clear felling, burning and weeding on the one hand, and the maintenance of a pure crop of a light demander on the other, are likely to cause rapid laterization and a change from an eminently suitable to an absolutely unsuitable soil for Teak. *From summary by M. V. Laurie.*

## 11.47. Maintenance of Favourable Soil Conditions

11.47 : 12.2. BECKER-DILLINGEN, J. Die Magnesiafrage im Waldbau. **[The magnesia problem in silviculture.]** *Forstarchiv* 16, 1940 (88–92). [G.] Biol. Abs. 14 (15334).

Fertilizing with MgO greatly reduced the number of yellowed needles in Pine and Spruce seedlings on Mg-deficient soil. The effectiveness of phosphate fertilizers also depends upon the presence of MgO in the soil. Potash-magnesia (a mixture of $K_2SO_4$ and $MgSO_4$) is the best Mg fertilizer. Dolomitic limestone may also be used. Sandy soils may be improved by pulverized basalt, gabbro, or diabase; these contain considerable MgO but are slow-acting.

11.47 : 12.2. PRIDHAM, A. M. S. **Response of mature American Elm to ammonium sulfate as a fertilizer.** *Proc. Amer. Soc. hort. Sci. 1939*, 37, 1940 (1075–6). [Cornell University, Ithaca, N.Y.] K.

Sulfate of ammonia (16 per cent. $NO_3$) used as a fertilizer for mature American Elm did not produce any marked stimulation in the growth of the trees when applied in the spring of the year and at a rate of 1 pound of fertilizer for each inch of trunk diameter. *Author's summary.*

11.47 : 22.5 : 11.42. KIVEKÄS, K. Jaskiviljelyksen vaikutus eräisiin maan ominaisuuksiin. **[On the influence of shifting cultivation with burning upon some properties of the soil.]** *Comm. Inst. for. Fenn.* 27 (2), 1938–9. pp. 44. [Fi.g.]

This type of cultivation was common in Finland in the past and is still met with in eastern Finland. Its effect on the acidity, the nitrogen, and the fertility of the top soil as determined by pot experiments with oats, were found to be chiefly as follows: a marked decrease of both active and potential acidity; somewhat decreased ammonification, probably owing to the decrease of the humus content of the soil, and somewhat increased nitrification; decreased nitrogen content; and increased fertility owing to the availability of much larger amounts of easily soluble nutrients (a fact confirmed by chemical analysis) and to generally more favourable growth conditions.

## 11.6. *Hydrographical Conditions including Erosion*

11.6 (213). PENDLETON, R. L. **Soil erosion in the tropics.** *J. For.* 38, 1940 (753–62).

11.6 : 07.7 : 11.42 : 01.6. KOHNKE, H., DREIBELBIS, F. R., and DAVIDSON, J. M. **A survey and discussion of lysimeters and a bibliography on their construction and performance.** *Misc. Publ. U.S. Dep. Agric.* No. 372, 1940. pp. 67. [Soil Conservation Service, U.S.D.A.]

11.6 : 23.3. GIBBS, J. A. **Five years of tree planting in the Ohio Valley.** *Soil Conserv.* 6, 1940 (146–9). [Soil Conservation Service, Dayton, Ohio.]

A review of experience gained in anti-erosion afforestation on farms: Pine plantations were generally more successful on eroded soils than Black Locust. Of the trees planted in 1935–6 79 per cent. were Locust and 8 per cent. Pine, whereas in 1938–9 the percentages were 35 for Locust and 52 for Pine. There has also been a decided trend away from gully planting and towards planting on eroded fields instead. Tree growth has been satisfactory on very steep unsloped banks, and live check dams formed by planting rows of trees a few inches apart across the bottom of gullies have proved fully effective. Direct sowing of light-seeded hardwoods offers considerable promise, while stratifying such seed as Walnut and Oak, followed by spring sowing, minimizes loss by rodents. At present the most vital need in the farm forestry programme of the region is to demonstrate to farmers the damage to young trees, both planted and native, from grazing by livestock.

11.6 : 23.3 : 6. DIEBOLD, C. H. **Strip planting for flood control.** *J. For.* 38, 1940 (810–2). [Allegheny Forest Exp. Sta.]

Studies, in fully stocked coniferous stands, of crown closure and humus development, which are directly related to soil porosity and infiltration capacity, indicate that Scotch and Pitch Pine are of value in flood control, particularly when closely spaced (5 × 5 ft.). An example is given of a multi-purpose plantation, pure plantings of species most suitable for each particular management objective, such as flood control or timber production, being established in narrow, adjacent strips along the contours.

## 12.1. *General Botany*

## 12.11. Physiology. Biology [including Genetics]

12.11. GAVRILOV, K. I. **On the dynamics of growth-substances of the group B (bios) in plants.** *C. R. Acad. Sci. U.R.S.S.* 22, 1939 (365–9). Hort. Abs. 10 (1275).

Trials are described on the content of bios substances at different times of day and year in leaves and flower buds of *Tilia cordata*, *Betula pubescens*, *Fraxinus excelsior*, *Syringa vulgaris*, and *Ulmus effusa*.

12.11 : 11.11. REYNOLDS, E. S. **Tree temperatures and thermostasy.** *Ann. Mo. bot. Gard.* 26, 1939 (165–255). [Washington University.] K.

A continuous, accurate automatic record of air temperatures and cambium and centre temperatures of a *Populus deltoides* tree was kept for about 4 years. About the freezing point the tree temperatures usually did not follow immediately that of the air, and often did not drop below zero until after 24 hours or more, whereas below zero, as a rule, they closely approximated the air temperature. At high temperatures, a thermostatic cooling action took place in the tree tissue. This was effective during the years of observation and essentially from the beginning of the period of full foliage, thus indicating that transpiration is the means by which air temperatures affect thermostatic cooling.

12.11 : 12.2. JOHNSSON, H. **Cytological studies of diploid and triploid *Populus tremula* and of crosses between them.** *Hereditas*, *Lund* 26, 1940 (321–52). Pl. Breeding Abs. 11 (212).

Triploid ($2n = 3x = 57$) clones of *P. tremula*, of which 9 have been found in Sweden, are discovered by examining Aspens that have large leaves. It is shown that this is as good an indicator of polyploidy as large stomata, though some diploids may have as large leaves and stomata as triploids. Of the 9 triploid clones known, 4 are pure males, 3 pure females, and 2 have not been determined. No intersexes have been found. In the progenies of reciprocal crosses between triploids and diploids a number of aneuploid and tetraploid seedlings occurred. The stoma length and height growth of the diploid × triploid progenies were also studied. On the average the aneuploids had longer stomata and were less

vigorous than the diploids. The tetraploids were also less vigorous than the diploids, but it is suggested that this may be due to their being hybrids between races with different photoperiodic requirements. [Cf. *For. Abs.* 2 (117).]

## 12.12. Pathology

12.12 : 11.14 : 12.2. DAY, M. W. **Snow damage to conifer plantations.** *Quart. Bull. Mich. agric. Exp. Sta.* 23, 1940 (97–8).

Following a total snowfall of 128 in. in the Upper Peninsula of Michigan during the winter of 1938–9, snow damage was assessed in a number of conifer plantations aged 10–13 years from the time of planting. The damage consisted almost entirely of a breaking away of the lower branches below the snow level. The percentage of trees damaged was over 17 for Red Pine, over 7 for White Pine, and 2 to less than 1 for White Spruce, Norway Spruce, and Scots Pine. The damage was mostly to the smaller trees of the stands, especially when these were surrounded by larger trees. No damage whatever was found in a quarter-acre plot of Red Pine containing 175 trees averaging 7·8 ft. in height, which had been pruned in the autumn of 1938 to an average height of about 4½ ft. from the ground.

12.12 : 11.16 (73). **Fourth annual report, National Shade Tree Conference Lightning Struck Tree Survey.** *Proc. nat. Shade Tree Conf.* 16, 1940 (161–7).

The general indications gained during the 4 years covered by this report are: (i) Susceptibility to lightning strike decreases by genera, the most susceptible genera, in decreasing order of susceptibility, being *Quercus*, *Ulmus*, *Pinus*, *Populus*, *Fraxinus*, *Liriodendron*, and *Acer*. (ii) The trees most frequently struck have been those standing alone or in a small group, and those taller than nearby trees.

12.12 : 11.42 : 12.2 : 21.3. LUDBROOK, W. V. **Boron deficiency symptoms on Pine seedlings in water culture.** *J. Coun. sci. industr. Res. Aust.* 13, 1940 (186–90). R.A.M. 20 (40–1).

In water cultures of young *Pinus radiata* and *P. taeda* most of the plants given inadequate supplies of boron showed a reduced growth rate followed by cessation of apical growth and the development of necrotic symptoms at the growing points of the tips and roots. The cessation of apical growth was accompanied by swelling of the stem apex, death of young needles adjacent to the apical bud, and resin exudation from the bud. The juvenile needles were shortened and bluish-green, while the mature needles were slow in appearing, few, and short. In some of the boron-deficient plants the fasciculate needles showed a tendency to fusion. It is not claimed that the needle-fusion symptoms occurring in Pine plantations are due to boron deficiency, as it is possible that needle fusion has more than one cause. Mycorrhizal development, which is dependent upon active root growth, may possibly be affected by boron deficiency in plantation soils.

12.12 : 12.2 (66.7). DADE, H. A. **A revised list of Gold Coast fungi and plant diseases.** *Kew Bull.* 1940 (205–47).

12.12 : 12.2. CAMPBELL, W. A., and DAVIDSON, R. W. **Top rot in glaze-damaged Black Cherry and Sugar Maple on the Allegheny Plateau.** *J. For.* 38, 1940 (963–5). [Bureau of Plant Industry, U.S.D.A.]

Examination of glaze-damaged Black Cherry and Sugar Maple 40 and 48 months respectively after the storm indicated that: (*a*) Downward decay from top breakage in Black Cherry should be limited to 2 or 3 ft. below wounds 3 in. in diameter or less, and trees of this type are good risks for saw-timber production provided breaks are confined to branches and the upper part of the main stem and there is vigorous crown regeneration. The common wound parasites such as *Polyporus versicolor* and *Stereum sameale* will eventually die out as the wounds heal. (*b*) Decay from such wounds on Sugar Maple, caused by *Polyporus versicolor*, *P. hirsutus*, *Hypoxylon* sp., and other fungi, should be limited to less than 6 in. below the break.

12.12 : 12.2. LONG, W. H., and GOODDING, L. N. **Notes on *Gymnosporangium cupressi*.** *Mycologia* 32, 1940 (489–92). R.A.M. 20 (2).

Circumstantial evidence suggests that a fungus found in the pycnidial and aecidial stages on *Amelanchier mormonica* (?) belongs to the life cycle of *G. cupressi*. An emended description is given of the teleutospore stage found on *Cupressus arizonica* and its var. *bonita*.

12.12 : 12.2. RAY, W. W. **Notes on *Gymnosporangium* in Oklahoma.** *Mycologia* 32, 1940 (572–4). R.A.M. 20 (2).

An annotated list of 8 species and varieties of *Gymnosporangium* found on *Juniperus* in Oklahoma in spring, 1939. *G. exiguum* is recorded for the first time in this State, attacking but causing no apparent injury to *J. mexicana*. The latter is immune from *G. juniperi-virginianae* and is being recommended for planting in place of *J. virginiana*.

12.12 : 12.2. BOWEN, P. R. ***Cenangium abietis, Brunchorstia destruens,* and *Crumenula abietina.*** *Proc. Pa. Acad. Sci.* 14, 1940 (95–9). R.A.M. 20 (41).

From cultural observations and inoculation experiments it is concluded that neither *Cenangium abietis* nor *Brunchorstia destruens* (which are distinct species) is parasitic on young Pines in the United States, and that *B. destruens* is the imperfect stage of *Crumenula abietina*.

12.12 : 12.2. HIRT, R. R. **Relative susceptibility to *Cronartium ribicola* of 5-needled Pines planted in the East.** *J. For.* 38, 1940 (932–7). [Bureau of Plant Industry, U.S.D.A.]

Eleven species of 5-needled Pines were exposed to natural inoculation by the fungus and later grown in plantations subject to the prevailing meteorological conditions. *Pinus lambertiana*, *P. excelsa* and *P. parviflora* died in large numbers during the first winter following the season of inoculation and were not tabulated in the final results. *P. cembra* var. *helvetica* did not become infected. *P. monticola* and *P. flexilis* were more susceptible than *P. strobus* and the remaining 4 species were less so in the following order: *P. strobiformis*, *P. peuce*, *P. koraiensis*, and *P. aristata*. *From author's summary.*

12.12 : 12.2. LUDBROOK, W. V., and WHITE, N. H. **Observations and experiments on *Diplodia* die-back of Pines at Canberra, A.C.T.** *J. Coun. sci. industr. Res. Aust.* 13, 1940 (191–4). R.A.M. 20 (40).

The results of observations and inoculations indicate that under the local conditions prevailing at Canberra *Diplodia pinea* is not likely to cause serious injury to Pines in the absence of factors predisposing to infection. The fungus is ubiquitous as a saprophyte on debris in Pine forests and is undoubtedly capable of parasitizing limited portions of vigorous trees, but such trees are normally able to resist its advance and confine the damage to insignificant proportions. One isolate of *D. pinea* was distinctly more pathogenic to Lemons than the typical strains.

12.12 : 12.2. MOUNCE, I., BIER, J. E., and NOBLES, M. K. **A root-rot of Douglas Fir caused by *Poria weirii*.** *Canad. J. Res.* 18, Sec. C, 1940 (522–33). [Science Service, Department of Agriculture, Ottawa.] P.R.

A laminated root rot of Douglas Fir [*Pseudotsuga taxifolia* (Lamb.) Britt.] occurs in young stands in Vancouver Island, B.C. The decay, the sporophore associated with it, and the cultural characters of the fungus are described. A comparison with *Poria weirii* Murr., previously reported only on *Thuja plicata* D. Don, shows a close resemblance in all respects between the two fungi. *Authors' summary.*

12.12 : 12.2 : 32.1. HEPTING, G. H., GARREN, K. H., and WARLICK, P. W. **External features correlated with top rot in Appalachian Oaks.** *J. For.* 38, 1940 (873–6). [Bureau of Plant Industry, U.S.D.A.]

A correlation was established between the amount of top or trunk rot and the number of rotten branch stubs, surface injuries, and blind knots on the bole; the trees examined were divided into 5 risk classes based on the presence of these external symptoms. The average volume of cull was determined for each risk class. A good correlation was obtained between cull and age of tree, and while good risk trees remained sound to an old age, the poorer risk trees began to develop considerable top rot between 50 and 100 years in the case of the Black Oak group, and 100 and 150 years in the White Oaks.

12.12 : 12.2. SMUCKER, S. J. **Apparent recovery of American Elms inoculated with *Ceratostomella ulmi*.** *Phytopathology* 30, 1940 (1052–4). [Bureau of Plant Industry, U.S.D.A.]

In 1936, 115 trees of *Ulmus americana* about $\frac{3}{4}$ in. in diameter at the base, which had shown pronounced external symptoms after inoculation with *Ceratostomella ulmi*, were set aside for observation. During 1937 only 3, and by 1938 only one of these developed outward signs of disease. Examination showed that these cases were not due to re-infection. Since 1938 none of these 3 trees has shown any external symptoms, and growth has been comparable to that of non-infected controls. The remaining 112 trees were thoroughly sampled for *C. ulmi* at intervals; in January

1937 all trees yielded the fungus, but by April, 1940, the number had dropped steadily to 82, indicating that the fungus had gradually died in some of the trees. In 1939 a number of the trees that had failed to yield *C. ulmi* were re-inoculated with a culture freshly isolated from the 1936 annual ring of an apparently re-covered tree. All of this group again developed external symptoms of disease, thus showing that failure of the trees to develop such symptoms during seasons following inoculation was due neither to loss of pathogenicity in the fungus nor to any immunity acquired by the hosts.

12.12 : 12.2 : 13.2. FELT, E. P. **Balloon releases and Dutch Elm disease spread.** *Bull. Bartlett Tree Res. Lab.* No. 3, 1939 (20–5).

Balloon returns indicate the possibility of a fairly close connexion between the occurrence of Dutch Elm disease in New England and the drifting of infected Elm bark beetles for considerable distances with the wind.

12.12 : 12.2 : 13.2. BUCHANAN, W. D. ***Scolytus sulcatus* Lec. transmits Dutch Elm disease fungus under controlled conditions.** *J. econ. Ent.* 33, 1940 (250–1). R.A.M. 19 (680).

Specimens of *Scolytus sulcatus* that had been artificially contaminated with *Ceratostomella ulmi* were shown to inoculate Elm and Apple trees, the latter being probably the most favoured of the several host species of this beetle. Elms were also infected by beetles obtained from diseased Elm wood, but the degree to which the beetles may be involved in spreading the disease is still conjectural.

12.12 : 12.2 : 13.2 : 23.26. HEIT, C. E., and HENRY, H. K. **Notes on the species of white grubs present in the Saratoga Tree Nursery.** *J. For.* 38, 1940 (944–8). [New York State Conservation Department.]

At least eleven species of phytophagous scarabaeoid larvae were observed to feed on the roots of coniferous trees. The species *Polyphylla variolosa*, *Phyllophaga tristis*, *P. fusca*, *P. anxia*, *Diplotaxis sordida*, and *Pachystethus lucicola*, caused severe damage during at least one year of the six-year period of observation, the first-named species being the most important. Grubs of all species were reared and identified and diagnostic characteristics recorded.

12.12 : 12.2 : 13.2 (68.9). **The *Eucalyptus* snout-beetle in Rhodesia.** *Rhod. agric. J.* 37, 1940 (185). R.A.E. A29 (30).

*Gonipterus scutellatus* Gylh., which attacks the foliage of *Eucalyptus*, was first noted in the Union of South Africa in 1916 and is thought to have been accidentally introduced from Australia 10 years before. In 1926, the egg parasite *Anaphoidea nitens* Gir. was introduced against it, and recently both host and parasite have been recorded from Southern Rhodesia. As both were observed in Southern Nyasaland in 1937, it is probable that they spread from South Africa through Rhodesia and that other plantations in Southern Rhodesia are affected.

12.12 : 12.2 : 13.2. CHERIAN, M. C., and BASHEER, M. ***Noorda moringae* Tams, a new Pyralid pest of *Moringa pterygosperma*.** *Indian J. Ent.* 1 (3), 1939 (77–82). R.A.E. A28 (560).

12.12 : 12.2 : 13.2. KÔNO, H. Eine neue *Rhynchites*-Art, schädlich an Yezofichten in Hokkaido. **[A new species of *Rhynchites* (*R. haradai* sp. n.), harmful to *Picea jezoensis* in Hokkaido.]** *Insecta matsum.* 14, 1940 (67–8). [G.] R.A.E. A29 (40).

12.12 : 12.2. CRAIGHEAD, F. C. **Some effects of artificial defoliation on Pine and Larch.** *J. For.* 38, 1940 (885–8). [Bureau of Entomology & Plant Quarantine, U.S.D.A.]

Results of experiments: (1) Complete removal of old and new foliage from Jack and Scotch Pine resulted in the early mortality of all trees so treated. (2) Early spring defoliation of new foliage only from these species did not kill the trees, but caused a slight decrease in wood production, stimulated needle growth, and caused retention of old needles and scarious bracts, which elongated and developed chlorophyll. (3) Late spring defoliation of new foliage caused mortality of all Jack Pine treated and of one out of three Scotch Pine, and brought about a drastic reduction in wood production. (4) The early and late removal of old foliage from the Pines did not kill any of the trees but resulted in a marked decrease in wood output during the year of defoliation, the late treatment being particularly effective. (5) One or two complete defoliations of Larch during the growing season did not kill the trees and injury was about in proportion to severity of defoliation.

12.12 : 12.2 : 13.2 : 21.6 : 56. EVENDEN, J. C. **Effects of defoliation by the Pine butterfly upon Ponderosa Pine.** *J. For.* 38, 1940 (949–55). [Bureau of Entomology & Plant Quarantine, U.S.D.A.]

An outbreak of the Pine butterfly (*Neophasia menapia*) in Central Idaho in 1922 resulted in the severe defoliation of Ponderosa Pine on some 27,000 acres. Of 100 defoliated mature trees examined from 1924 to 1935, 26 per cent. died and the growth of the survivors was adversely affected by the defoliation, a number of trees failing to add any basal increment during periods of one to eleven years. It is believed that severity of defoliation is the most important factor governing the survival or death of defoliated trees.

12.12 : 12.2 : 13.2. PARR, T. ***Asterolecanium variolosum* Ratzeburg, a gall-forming Coccid, and its effect upon the host trees.** *Bull. Yale Univ. Sch. For.* No. 46, 1940. pp. 49 + plates.

An account is given of the distribution, biology, and anatomy of *Asterolecanium variolosum*, and of its effect on the host trees. Unless English Oak is present, Chestnut Oak (*Quercus montana*) is the most favoured host in the north-eastern United States. Other species of the White Oak group may be seriously infested, but only when associated with Chestnut Oak. Young growth in the 6–10 ft. height class is most seriously affected; large trees are sometimes killed by a heavy infestation in combination with other factors, but it is doubtful whether the insect alone could produce such a result. On branches ¼ to 2 in. thick a population of over 50 insects per sq. in. of bark surface will probably kill the branch, and one of over 100 per sq. in. will certainly do so. On smaller branches, where the galls often coalesce, a much lighter population is sufficient to cause death. The parts attacked produce true galls, the greatest proliferation occurring in the collenchyma. The affected tissues, which include the epidermis, phellogen, collenchyma, phloem and cambium, eventually die. If infestation is light such areas may callus over and again become infested.

The stimulus inducing gall formation is chemical in nature and has been reproduced by injecting salivary extract from the insects. Since the salivary extract is inactivated by heating to 60° C., the stimulating agent is probably an enzyme or enzyme-like substance or group of substances. The presence of the enzymes amylase, invertase, and proteases was definitely established; tests for oxidase and peroxidase gave doubtful results; and cellulase was shown to be absent in the extract.

In the plant tissues, starch gradually disappears as the gall develops and is replaced by glucose and sucrose, which are later removed by the insect. Tests indicate the presence of proteases in the gall, particularly around the stylets of the insect. Oxidases at first increase in activity and later diminish, the decrease in their activity being accompanied by a rise in the tannin content of the affected part.

12.12 : 12.2 : 13.2. CHATTERJEE, N. C. **Entomological investigations on the spike disease of Sandal. A summary account of the fauna obtained on sticky papers exposed in Sandal forests with a list of suspected vectors.** *Indian J. Ent.* 1 (3), 1939 (15–24). R.A.E. A28 (557–8).

12.12 : 12.2 : 13.2. RANGASWAMI, S., and GRIFFITH, A. L. **Entomological investigations on the spike disease of Sandal (35): Further studies on the spike disease of Sandal.** *Indian For. Rec.* (*n.s.*) *Entomology* 6, 1940 (85–196).

An interim report giving details of experiments carried out in the Madras Presidency since 1933. Information resulting from these experiments shows that: (*a*) The disease has been transmitted by the grafting of a variety of tissue from disease-masking trees, while the artificial defoliation of such trees forces out in the new flush of leaves the masked symptoms of the disease. (*b*) The average period from infection to manifestation of the disease is roughly 7 months in the case of natural infection, and 4½ months in the case of artificial infection. (*c*) The average period from manifestation of the disease to the death of the tree is roughly 15 months but varies with girth of the tree. (*d*) The agency of infection works above ground. (*e*) There are two seasons of infection, March–April and August–November. (*f*) The vector is active as a transmitting agent and frequents Sandal foliage at night. (*g*) An exposure of one month is sufficient for infection to take place. (*h*) The vector can pass through a mesh of ¼in. but is excluded by a mesh of $\frac{1}{20}$ in. *From authors' summary.*

12.12 : 12.2 : 13.2. CRAIG, J. W. **Crow damage to conifers.** *J. For.* 38, 1940 (969).

Perching by the American or carrion crow on Scots, Red and White Pine was observed to cause breakage or distortion of the terminal shoots and branches.

## 12.13. Embryology

12.13 : 12.2. GRAVATT, A. R., LATHAM, D. H., JACKSON, L. W. R., YOUNG, G. Y., and DAVIS, W. C. **Multiple seedlings of Pines and Douglas Fir.** *J. For.* 38, 1940 (818). [Bureau of Plant Industry, U.S.D.A.]

Instances of two seedlings developing from a single seed have been noted for *Pinus banksiana*, *P. ponderosa*, *P. resinosa*, *P. sondereggeri*, *P. strobus* and *Pseudotsuga taxifolia*.

## 12.14. Morphology. Anatomy. Histology

12.14 : 12.11 : 12.2. SAMPATH, S., SINGH, B. N., and BANSAL, R. K. **Effect of colchicine on plant cells.** *Curr. Sci.* 8, 1939 (121–2). [Institute of Agricultural Research, Benares Hindu University.] L.S.

Typical effects of colchicine, such as irregular arrangement of chromosomes, failure of the anaphase stage, and occurrence of tetraploid cells, were observed when sprouted seeds of *Pinus excelsa* and *P. gerardiana* were arranged so that the radicles grew into a 1 : 1000 aqueous colchicine solution. All the dividing cells showed marked elongation, as a result of which the radicles lengthened during treatment. All the root tips survived and grew well.

## 12.15. Phenology

12.15. HOLTTUM, R. E. **Periodic leaf-change and flowering of trees in Singapore. II.** *Gdns.' Bull.* 11, 1940 (119–75).

The uniformity of climate at Singapore makes it possible to observe the difference in behaviour between the trees that change their leaves after a definite period without relation to climatic change and those that react to such climatic changes as do occur by leaf shedding and leaf renewal. Varying degrees of deviation from periodic leaf change are recorded. Details of observations are given for individual tree species.

12.15 : 01. WATSON, J. G., SYMINGTON, C. F., and DURANT, C. L. **The use of the term 'deciduous' as applied to tropical forests.** *Emp. For. J.* 19, 1940 (269–73).

In reply to Burtt Davy and Kinloch [*For. Abs.* 1 (223)] the writers point out from experience in Malaya that there are many instances in which the leaf fall of tropical trees is not related to flowering or fruiting, and that sexual maturity is not necessarily a pre-requisite for deciduousness in the tropics. Malayan trees exhibit every transition between deciduousness and the evergreen habit, leaf fall may follow a regular rhythm or recur at totally irregular intervals, and the leafless period is equally variable in length. In view of these and similar observations it is suggested that though leaf fall is fundamentally a response to unfavourable growing conditions, trees that have acquired the deciduous habit in some past period will continue to exhibit it in non-seasonal climates where the need for it no longer exists. Though caution should be exercised in the classification of tropical trees as deciduous or evergreen, the present application of the term cannot be condemned, and the real point is rather that the deciduous habit is not a suitable character for ecological classification in tropical forest.

12.15 : 12.2. LITTLE, S. **Seed fall of Atlantic White-Cedar.** *Tech. Note Allegh. For. Exp. Sta.* No. 26, 1940. p. 1.

Seed dispersal of *Chamaecyparis thyoides* in southern New Jersey began about 15th October, and continued throughout the year although 39 per cent. of the seed crop fell in the first month and 60 per cent. in the first two months. Mature stands released 8–9 million seeds per acre.

12.15 : 12.2. LITTLE, S. **Seed fall of Short-leaf Pine.** *Tech. Note Allegh. For. Exp. Sta.* No. 27, 1940. p. 1.

Seed of *Pinus echinata* began to fall in the last half of October and continued until April. Sixty-nine per cent. of the seed crop fell in the first month and 90 per cent. during the first two months. Rain rapidly reduced seed dispersal, causing a partial closing of the cones.

12.15 : 12.2 : 11.14. BOSWELL, A. B. S. **Rainfall and the flowering of *Shorea*.** *Malay. For.* 9, 1940 (175–7).

It is concluded that there is no evidence that rainfall plays a major part in inducing trees of species of *Shorea* to flower. Records of girth increment indicate a noticeable reduction of growth during the flowering and fruiting period.

## 12.19. Geographical Distribution. Plant Geography and Sociology

12.19 (77.5). THOMSON, J. W. **Relic prairie areas in central Wisconsin.** *Ecol. Monogr.* 10, 1940 (685–717).

Historical evidence and the presence of relic communities of prairie plants show that in Wisconsin the prairie once had a much wider range than at present. It was displaced by forest, which continues to invade the remaining relic communities. Some of the prairie plants are spreading from the relic communities to the sandy soils of central Wisconsin where they colonize areas disturbed by the activity of man, such as roadsides and abandoned fields, and, after some years, are superseded by forest of Jack Pine, Aspen, and, later on, Oak.

### 12.19.1. *Regional Floras*

12.19.1 : 07 (91.2). BLOEMBERGEN, S. Verslag van een exploratie-tocht naar Midden-Celebes. **[Report on a forest-botanical tour in central Celebes.]** *Tectona* 33, 1940 (377–418). [Du.e.]

The tour covered some of the Lindoe Lake and Goenoeng Ngilalaki region. The number of tree species, especially in the lower forests, is very large and as yet insufficiently known. During the twelve-day tour, 72 trees were sampled of which three were unknown to the Forest Research Institute.

### 12.19.2. *Forest Types and Woodland Communities Past and Present*

12.19.2. KUJALA, V. Metsätyyppien paralleli-suudesta. **[On parallels among forest types.]** *Comm. Inst. for. Fenn.* 27 (1), 1938–9, pp. 17. [Fi.g.]

Past research on forest types in Finland, the U.S.S.R., Central Europe, North America, and elsewhere, has revealed certain parallels indicating the possibility of classifying the forest types of the world within a relatively simple system; such classification would facilitate international collaboration in this branch of research.

12.19.2 : 23.4 : 12.2 : 11.4. COILE, T. S. **Soil changes and Loblolly Pine succession.** *Abstract* in *Proc. Soil Sci. Soc. Amer.* 4, 1939 (353–4). [Duke University, Durham, N.C.] H.S.B.

The site studied was a Georgeville stony clay-loam in the Piedmont Plateau region of North Carolina and bore the following succession: *Andropogon*, Loblolly Pine, and the climax Oak/Hickory forest, represented by the White Oak/Black Oak/Red Oak forest type. Invasion and development of Loblolly Pine on abandoned land did not appear to be related to changes in either physical or chemical soil properties, neither did the invasion of many hardwoods, including the climax species, appear to be determined by soil changes due to the presence of Loblolly Pine. Loblolly Pine invasion and the subsequent formation of pure even-aged stands seems to depend primarily on an abundance of wind-borne seed; Oak and Hickory seeds are transported by small rodents, and many years are required for the establishment of seedlings in appreciable numbers. When grown in competition with forest trees, Loblolly Pine seedlings have a superficial root system and seldom become established in either Pine or Oak forests in this region. In contrast, Oaks and Hickories early develop deep tap roots and are able to become established in forest stands, thus leading eventually to an all-aged forest.

The soil changes during the succession are discussed. Both the $A_0$ horizon and the surface mineral soil were found to be markedly influenced by the chemical nature of the litter of trees occurring in appreciable numbers in the succession. Total N, C/N ratios, and exchangeable Ca are probably more favourable in Loblolly Pine stands with a well-developed hardwood understorey than in the climax forest. The field percolation rate was also found to be highest in middle-aged Pine stands. *From author's summary.*

## 12.2. *Special [Systematic] Botany*

12.2. WEHMEYER, L. E. **Contributions to a study of the fungus flora of Nova Scotia. V. Discomycetes.** *Canad. J. Res.* 18, Sec. C., 1940 (535–49). [University of Michigan.] P.R.

12.2 : 12.12 : 31.42. ITO, S., and IMAI, S. **Fungi of the Bonin Islands. V.** *Trans. Sapporo nat. Hist. Soc.* 16, 1940 (120–38). R.A.M. 19 (731).

An annotated list of 56 fungi, chiefly Polyporaceae, found in the Bonin Islands, mostly on living or dead wood. A number of new species and combinations, and one new genus, are included.

12.2 : 31.42. VIÉGAS, A. P. Uma nova espécie do gênero *Dendrothele*. **[A new**

**species of the genus *Dendrothele*.**] *Rodriguesia* 4, 1940 (283–7). [Port.e.]

*D. alba* sp. nov. is described from dead branches of *Moquinia polymorpha* D.C.

12.2 : 12.19 : 12.12. CROWELL, I. H. **The geographical distribution of the genus *Gymnosporangium* (with particular reference to alternation of generations and dependence upon host species).** *Canad. J. Res.* 18, Sec. C, 1940 (469–88). [Macdonald College, Quebec.] P.R.

12.2. SEELER, E. V. **A monographic study of the genus *Thyronectria*.** *J. Arnold Arbor.* 21, 1940 (429–60). [Arnold Arboretum, Harvard University.]

12.2 (91.1). AIRY-SHAW, H. K. **Additions to the flora of Borneo and other Malay islands. XVIII. The Oxford University Expedition's Sarawak Collection, 1932: miscellaneous families, including Ochnaceae, Meliaceae, Cunoniaceae and Thymelaeaceae.** *Kew Bull.* 1940 (248–62).

The following new species and varieties are described: *Trigoniastrum hypoleucum* Miq. vars. *oliganthum* and *viride*, *Dysoxylum fulvum*, *Chisocheton rhytidocalyx*, *Weinmannia dulitensis*, *W. aphanoneura*, and *Aquilaria cumingiana* (Decne.) Hall. var. *parviflora*.

12.2 (72). LUNDELL, C. L. **Two new trees from the mountains of Mexico [*Abies tacanensis* and *Linociera areolata* spp. nov.].** *Amer. Midl. Nat.* 23, 1940 (175–6). Biol. Abs. 14 (13854).

12.2. EPLING, C., and ROBINSON, W. ***Pinus muricata* and *Cupressus forbesii* in Baja California.** *Madroño* 5, 1940 (248–50). K.

12.2 (51 : 59). CROIZAT, L. **New and critical Euphorbiaceae from eastern tropical Asia.** *J. Arnold Arbor.* 21, 1940 (490–510). [Arnold Arboretum, Harvard University.]

New tree species described in this paper are *Mallotus metcalfianus* and *Sapium laui*.

12.2 (7 : 8). SMITH, A. C. **The American species of Hippocrateaceae.** *Brittonia* 3, 1940 (341–555).

12.2. HOWARD, R. A. **Studies of the Icacinaceae, I. Preliminary taxonomic notes.** *J. Arnold Arbor.* 21, 1940 (461–89). [Gray Herbarium, Harvard University.]

Consists mainly of a discussion of the status of various genera in the family. A number of new combinations are made, and two new species—*Citronella peruviana* and *Oecopetalum guatamalense*—are described.

12.2. BREMEKAMP, C. E. B. **A monograph of the genus *Pavetta* L.: additions and emendations. I & II.** *Rep. Spec. nov. Reg. veg., Berlin* 47, 1939 (12–28, 81–98). Biol. Abs. 14 (15241, 15242).

12.2 : 3 : 2. CARLSON, K. A. ***Eucalyptus saligna*—minimisation of waste.** *J. S. Afr. For. Ass.* No. 5, 1940 (84–9).

Experience in the growing of this species in the Transkei. It is pointed out that excessive splitting of the wood is caused by the stresses set up as a result of differences in the texture of the tree core and the sapwood, which, in turn, is brought about by too rapid diameter growth. Hence the aim in silvicultural practice should be to retard diameter growth rather than to accelerate it.

This species should be grown on a deep, firm soil, free from severe frost, and preferably with an average rainfall of 40 to 50 in. The ideal planting espacement is given as 8 ft. by 8 ft. Thinning should never follow a mathematical arrangement but should be applied with the idea of favouring the best trees and maintaining an even rate of growth.

Logs should be sawn in a frame saw within a few days of felling. Otherwise they should be submerged in water, though not for longer than a few weeks. Air seasoning gives satisfactory results, at least for wood up to 2 in. thick and grown under silvicultural treatment that does not allow too rapid diameter growth. The total percentage of waste from logs converted on a circular rack saw under difficult conditions varied from 45·5 per cent. for the 9-year-old class to 39·2 per cent. for the 17-year class. Comparison is made with figures presented in an earlier paper by M. H. Scott [cf. *For. Abs.* 2 (217)]. The wood from 17-year-old trees was of high quality and suitable for uses to which Teak, Oak and Mahogany are commonly put.

12.2 : 2 : 3 (68). SCHIEMER, E. L. **The growing of *Populus deltoides* in South Africa.** *J. S. Afr. For. Ass.* No. 5, 1940 (17–28). [Lion Match Co., Durban.]

It is suggested that this South African species of Poplar was imported from England or Holland and is identical with the European

mutation of the American variety *P. deltoides* Marsh. var. *missouriensis* Henry. This tree requires a deep, fertile, well-watered, well-drained and aerated soil and with good drainage its growth is not retarded by occasional flooding. It can be grown in a sub-tropical climate at sea level and at altitudes up to 6,000 ft. Wind-swept areas are not favourable to it.

Propagation is from cuttings best taken from one-year-old branches or stool shoots of 3- to 5-year-old trees. One-year-old plants, which may be 4 ft. high, are transplanted to a carefully prepared site and are cut back to ground level. Details are given of the propagation, planting and cultivation methods in practice.

The wood is used largely for match stock, for which clear timber is required. Pruning practice follows a general rule of confining the knotty core to 3 in. diameter. All bottom shoots and double leaders are removed at the end of the first year, the lower lateral branches 2 to 4 ft. up the stem at the end of the second year and from the fifth year onwards the crown is maintained at about one-third of the total height. This involves both dead and green pruning. Epicormic branches are removed while they are green and soft. The final crop consists of about 200 trees per acre and thinnings are marketable after the seventh year. For this and other reasons given, pruning is applied to the whole stand of some 500 trees per acre.

Trees 15 in. d.b.h., which is considered the most suitable size for match wood, can be grown on first-quality sites in fifteen years. Second-rotation crops may grow even more vigorously.

Notes are included on the character and uses of the wood, and on the injurious insects—the larvae of *Teragra guttifera*, which bore into the relatively soft wood in the upper part of the stem and branches, and *Eulophonotus myrmeleon*, which tunnels in the lowest portion of the stem.

12.2 : 12.19.2 : 57 : 76. Olson, C. E. **Forests in the Arizona desert.** *J. For.* 38, 1940 (956–9). [Soil Conservation Service, U.S.D.A.]

Dense stands of Mesquite (*Prosopis velutina*) of considerable extent exist in the river valleys of Southern Arizona and these supply large amounts of fuelwood, poles and posts, which could be increased by proper management. The seeds and pods are of value as food for stock. This species reproduces readily both from seed and by sprouting from the stumps. Growing conditions, rate of growth, and the financial returns obtained from marketing this wood are discussed.

12.2 (95). Merrill, E. D., and Perry, L. M. **Plantae Papuanae Archboldianae, IV.** *J. Arnold Arbor.* 21, 1940 (511–27). [Arnold Arboretum, Harvard University.]

Includes the descriptions of a number of new tree species in the sapindaceous genera *Guioa*, *Cupaniopsis*, *Lepiderema*, *Mischocarpus*, *Dodonaea*, and *Harpullia*.

12.2 : 12.19 (81). Ducke, A. As espécies brasileiras de cacau (gênero *Theobroma* L.) na botânica sistemática e geográfica. [**The Brazilian species of Cacao (*Theobroma*): taxonomy and geography.**] *Rodriguesia* 4, 1940 (265–76). [Port.e.]

12.2 : 3. Lodewick, J. E. **Western Hemlock, past, present and future.** *Timberman* 41 (12), 1940 (36–42). [Pacific Northwest Forest & Range Exp. Sta.]

Western Hemlock (*Tsuga heterophylla*) lumber production in Oregon and Washington increased from a quarter of a million bd. ft. in 1899 to a peak of 1½ billion bd. ft. in 1928. The demand for this species as lumber has decreased considerably since then, resulting in excessive Hemlock log inventories and predominantly Hemlock stands following selective logging. On the other hand the use of this species as pulpwood has increased from 93 million bd. ft. in 1919 to 932 million bd. ft. in 1937. At present there is a total stand of 161 billion bd. ft. of Hemlock in Oregon, Washington and British Columbia, of which 60 per cent. is old growth, and some four million acres of land on which Hemlock is a significant component of the stand. 1·6 billion bd. ft. are cut each year, 30 per cent. for lumber and 70 per cent. for pulp. The writer analyses the reasons for the decrease in demand for Hemlock lumber and discusses the future utilization of this species and the management of stands containing it, suggesting the possibility of girdling and poisoning defective trees.

## 13.2. *Special [Systematic] Zoology*

13.2. Fisher, W. S. **New Cerambycidae from India, II. (Coleoptera).** *Indian For. Rec. (n.s.) Entomology* 6, 1940 (197–212). [Bureau of Entomology & Plant Quarantine, U.S.D.A.]

The following are described: *Oemospiloides* gen. n., *O. bengalensis* sp. n., Bengal; *Entetraommatus* gen. n., *E. quercicola* sp. n., Garhwal; *Neachryson* gen. n., *N. orientale* sp. n., Madras; *Pachydissus xyliae* sp. n., Burma; *Cleomenella* gen. n., *C. singhi* sp. n., Madras; *Paramimistena* gen. n., *P. polyalthiae* sp. n., Bengal; *Eupogonioides brunneus* sp. n., Madras; *Exocentrus championi* sp. n., United Provinces; *E. transversifrons* sp. n., United Provinces; *E. chatterjeei* sp. n., Madras. *Summary by J. C. M. Gardner.*

13.2. GARDNER, J. C. M. **New Indian Cerambycidae (Coleoptera).** *Indian For. Rec.* (*n.s.*) *Entomology* 6, 1940 (213–25). [Forest Research Institute, Dehra Dun.]

The following new species are described: *Demonax salemensis* and *D. limoniae* from Madras; *D. sonneratiae* and *D. blairi* from Bengal; *D. atkinsoni* from Burma; *D. buteae* from United Provinces; *Perissus quercus* from United Provinces; *P. chatterjeei* from Bengal; *Raphuma chatterjeei* from United Provinces; *R. desaii*, *R. suthra*, *R. quercus* and *R. acrocarpi* from Burma; *R. salemensis* from Madras. *Clytosaurus siamensis* Jordan, previously known from Siam, is recorded from Burma. *From author's summary.*

13.2 : 12.12 : 12.2. MARSHALL, Sir G. A. K. **New injurious Curculionidae (Col.).** *Bull. ent. Res.* 31, 1941 (403–6).

Among the new species described are *Protostrophus salignae*, recorded as attacking seedlings of *Eucalyptus saligna* in Zululand; *Systates hargreavesii*, on *Markhamia platycalyx* and other trees in Uganda; and *Myllocerus spinicollis* on *Zizyphus jujuba* in the Punjab.

## 2. SILVICULTURE

### 21. SILVICULTURAL CHARACTERS OF TREE SPECIES

21.1 : 12.2. PEARSON, G. A. **Shade effects in Ponderosa Pine.** *J. For.* 38, 1940 (778–80). [Southwestern Forest & Range Exp. Sta.]

Experiments have shown that Ponderosa Pine will not reach normal development when growing in light intensities below 50 per cent. Plots subjected to 33 per cent., 50 per cent., and 85 per cent. shade showed a consistent drop in diameter and height growth with reduction in insolation. However, when the shade is confined to the sides of the trees and the tops are open to overhead light the difference in the effect of the three degrees of shade is relatively small. It is concluded that the side shade provided by the larger trees in virgin or partially cut stands is important in developing good stem form and fine branches in the sapling and pole stands.

21.1 : 12.14. LEVITT, J., and SIMINOVITCH, D. **The relation between frost resistance and the physical state of protoplasm. I. The protoplasm as a whole.** *Canad. J. Res.* 18, Sec. C., 1940 (550–61). [McGill University, Montreal.] P.R.

21.1 : 12.2 : 12.12. LORENZ, R. W. **High temperature tolerance of forest trees.** *Tech. Bull. Minn. agric. Exp. Sta.* No. 141, 1939. pp. 25. [University of Minnesota Agricultural Exp. Sta.]

The cortical parenchyma cells in microscopic sections from seedlings of *Catalpa speciosa*, *Ulmus americana*, *Pinus resinosa*, *P. strobus*, and *Picea glauca* were killed in 30 minutes when exposed to temperatures between 57° and 59° C. by immersion in a water bath, and in one minute at 65° to 69° C. Values for the heat required to kill these cells were also expressed in terms of the Arrhenius Formula and of van't Hoff's Rule ($Q_{10}$).

21.2 : 12.12. POOL, R. J. **Some reactions of the vegetation in the towns and cities of Nebraska to the great drought.** *Bull. Torrey bot. Cl.* 66, 1939 (457–64). [University of Nebraska, Lincoln.] O.B.D.

Observations during the severe drought periods prevailing between 1933 and 1938 in the northern prairie and plains region of the United States have given some indication of the drought resistance of a number of native and introduced tree species. *Celtis occidentalis* has consistently shown the greatest drought resistance among native hardwoods; other species, in decreasing order of resistance, are—*Gleditsia triacanthos*, *Fraxinus pennsylvanica* var. *lanceolata*, *Acer saccharinum*, *Platanus occidentalis*, *Ulmus americana*, and *U. fulva*. Of the planted hardwoods, *Quercus macrocarpa* was rather highly resistant, and *Ulmus parvifolia* did well, though most trees of the latter are too young for a reliable estimate of their susceptibility to be made. Among the conifers,

*Juniperus virginiana* suffered little, and good survival has also been shown by *Pinus nigra* and *P. sylvestris*. Most of the other tree species occurring in the region, both hardwoods and softwoods, have suffered very severely.

21.3 : 11.42 : 12.2 : 23.3. WILDE, S. A., and PATZER, W. E. **The role of soil organic matter in reforestation.** *J. Amer. Soc. Agron.* 32, 1940 (551–62). [University of Wisconsin, Madison.] L.S.

A study was made in central and northern Wisconsin of the effect of the organic-matter content of podzolized sandy soils upon the growth of young plantations of *Pinus banksiana*, *P. resinosa*, *P. strobus*, and *Picea glauca*. In these soils the organic-matter content showed a close relationship with the total N and available P and K contents. *Pinus banksiana* and *P. resinosa* showed a pronounced increase in height growth with increasing soil organic matter and though the correlation was not statistically significant there was also a general tendency to increased survival on the soils high in humus. Results suggest that the absolute minimum requirements of soil organic matter are: *Pinus banksiana* 0·6 per cent., *P. resinosa* 1·8 per cent., *P. strobus* 2·5 per cent., and *Picea glauca* 3 per cent. As a guide to the selection of species and planting sites a graph is presented in which the required percentage of soil organic matter is plotted for each species against soil texture requirements expressed as silt and clay per cent. The technique of sampling forest soil for organic matter is described.

21.4 : 07.7. ANGELO, E., and POTTER, G. F. **The error of sampling in studying distribution of the root systems of Tung trees by means of the Veihmeyer soil tube.** *Proc. Amer. Soc. hort. Sci. 1939*, 37, 1940 (518–20). [U.S.D.A., Bogalusa, La.] K.

The King or Veihmeyer soil tube is a sharp-edged tube which is driven through the area to be investigated, extracting a core of soil with roots included. These are then separated from the soil and weighed. Owing to the small size of the bore—$\frac{55}{64}$ in. diameter and 12 in. length—no harm is done to the trees, and the method has the advantage of cheapness.

In the investigation described, it was found that 100 tube samples for each area investigated allowed of distinguishing between root concentrations differing by 15 per cent. or more. The study was confined to roots of 2 mm. diameter or less, the method having proved unsatisfactory for larger roots.

21.4 : 11.41. HOPKINS, H. T., and DONAHUE, R. L. **Forest tree root development as related to soil morphology.** *Abstract* in *Proc. Soil Sci. Soc. Amer.* 4, 1939 (353). [Soil Conservation Service, U.S.D.A.] H.S.B.

A study of root development of trees in 3 different forest types on a brown podzolic soil and 2 podzol soils of the central Adirondack region gave the following results: (i) 70–80 per cent. of the roots of all tree species examined were distributed in the A horizons. (ii) Yellow Birch had more roots and branched more extensively in the $B_3$ horizon of every profile than did the other species. (iii) Sugar Maple ranked next to Yellow Birch in depth of rooting, but its roots branched less in the $B_3$ horizon. (iv) Beech had no roots in the $B_3$ horizon of two profiles and is believed to be more shallow-rooting than the foregoing species. (v) Balsam and Spruce were shallow-rooted. Balsam penetrated into the $B_1$ horizon of the Spruce flat profile, while Spruce had no roots beyond the $A_0$ horizon of two profiles. (vi) Spruce appeared to branch more extensively than Balsam, i.e. there were more Spruce roots in the diameter class under 0·06 cm. (vii) There was no correlation between tree height and root length. (viii) Root distribution was highly correlated with the organic-matter content and the moisture equivalent of the soil. (ix) No correlation was found between root distribution and the percentage of clay. (x) Organic matter in these Adirondack soils seems to be of importance in influencing the distribution of tree roots.

21.4 : 11.41 : 12.2. CROSSLEY, D. I. **The effect of a compact subsoil horizon on root penetration.** *J. For.* 38, 1940 (794–6). [Dominion Forest Nursery Station, Indian Head, Saskatchewan.]

Examination of two specimens of Burr Oak, one growing on a soil containing a relatively impervious layer and the second on a structureless sand offering little resistance to root penetration, showed that pan formation confines root development mainly to the superimposed soil horizons, the degree of restriction depending on the compactness of the pan layer. The irregular growth habit of Burr Oak roots growing under normal soil conditions is believed to be due to hereditary characteristics.

21.5 : 12.2. MIROV, N. T. **Tested methods of grafting Pines.** *J. For.* 38, 1940 (768–77). [Institute of Forest Genetics, California Forest & Range Exp. Sta.]

Several methods of grafting were tested and it was found that Pines belonging to distant groups could easily be grafted together. Colchicine-treated seedlings of Ponderosa Pine, which usually die within the first few weeks of life as a result of root rot, were successfully grafted on roots of healthy seedlings of the same species. Young shoots of old specimens of Ponderosa Pine were successfully grafted on transplants. Needle bundles of Ponderosa and Coulter Pine were successfully grafted. Inarching (grafting by approach) was found to be the best method of grafting under the semi-arid conditions of the California summer.

21.6 : 12.2. ISAAC, L. A. **'Water sprouts' on Sitka Spruce.** *For. Res. Note Pacif. Nthwest. For. & Range Exp. Sta.* No. 31, 1940 (6–7).

Examination of a 90-year-old stand showed that development of epicormic branches on Sitka Spruce was clearly related to exposure of the trees to side light. Thrifty new limbs were found only on trees within 60 ft. of the timber's edge, and mostly on those within 30 ft., and limbs alive but not thrifty were found on trees within 90 ft., while trees without epicormic branch formation were largely beyond 90 ft. of the timber's edge.

21.6 : 12.2. KACHIN, T. **Natural pruning in second-growth Douglas-Fir.** *For. Res. Note Pacif. Nthwest. For. & Range Exp. Sta.* No. 31, 1940 (5).

Lower branches begin to die at 10–15 years on dominants in well-stocked sapling stands but it takes 60 years from the death of the branch until complete occlusion, and more than 100 years to produce a completely surface-clear 16-ft. log. Furthermore trees of this species may develop epicormic branches, particularly thin-barked intermediate and suppressed trees exposed to the light.

21.6 : 12.2 : 23.11. ISAAC, L. A. **Mortality of Douglas-Fir seed trees on cut-over lands.** *For. Res. Note Pacif. Nthwest. For. & Range Exp. Sta.* No. 31, 1940 (11–2).

Mortality in seed trees varied with conditions of stand and operation from 2 to 92 per cent. over a period of fifteen years, being particularly heavy on slash-burned areas, an average of 9·3 per cent. of the original seed trees surviving on such areas. A third of the loss is due to windfall, while logging damage and slash burning account for nearly 25 per cent. of the losses on burned areas. Abundance of seed may be somewhat greater on single trees than on similar trees in virgin stands, but two scattered seed trees per acre is inadequate for satisfactory re-seeding.

21.7 : 12.2 : 38. MCCOMB, F., and MUNGER, T. T. **Roadside windfall in Spruce-Hemlock.** *For. Res. Note Pacif. Nthwest. For. & Range Exp. Sta.* No. 31, 1940 (8).

Windfall within 100 ft. of roads was found to be over four times that in the zone 100 to 200 ft. from the roads, and windfall on the upper side of the road was twice that on the lower side. The area studied was near the coast, the roads had been built within the past 5 years and most of them were on hillsides.

## 23. FORMATION OF STANDS

### 23.1. *Natural Formation of Stands*

23.1 : 12.2. PALOSUO, V. Tutkimus lehtikuusen luontaisesta uudistumisesta eräissä suomalaisissa lehtikuusikoissa. **[The natural regeneration of Larch in some Finnish Larch plantations.]** *Comm. Inst. for. Fenn.* 27 (3), 1938–9. pp. 65. [Fi.g.]

Larches (*L. europaa* and *L. sibirica*) are the only exotics that are grown in stands in Finland. The purpose of this investigation was to determine to what extent Larch is capable of spontaneous regeneration and of resisting the competition of indigenous species. The investigation included a study of seeding conditions, of natural regeneration plots, and both linear and ocular evaluations of regeneration in the surroundings of stands. The stands examined were of the *Myrtillus* (MT), *Oxalis-Myrtillus* (OMT), and *Oxalis-Maianthemum* (OMaT) types. The chief conclusions were as follows:—The amount of seed produced by Larch in average seed years is ample for reproduction. On MT and somewhat poorer sites, natural regeneration within the stand is secured by a gradual opening of the canopy, and within 30–40 m. from the edge of the stand by burning or cultivating the soil. On OMT, OMaT, and richer sites, natural reproduction can only be attained after effective preparation of the ground (burning and deep cultivation). In such cases artificial regeneration will often be more economical. Young Larch trees can stand several decades of ample shade and their power of recovery, though weaker than that of Spruces, is at least as good as that of Pines. On the whole it appears that Larch can maintain itself best on MT sites, while on

the better sites it is liable to be displaced by Spruce.

23.1 : 12.2. BARRETT, L. I. **Requirements for restocking cutover Loblolly and Shortleaf Pine stands.** *Sth. Lumberm.* 161 (2033), 1940 (200–2). [Appalachian Forest Exp. Sta.]

From observations in the Carolinas and Virginia, it appears that the practice of leaving only three to four seedbearers per acre cannot be relied upon for adequate regeneration of the coupe, while more intensive forestry measures so far recommended cannot be readily adhered to under present methods of operation on many properties.

23.13 : 12.2. ROWNTREE, J. B. **Grazing versus burning as an aid to Sal regeneration.** *Indian For.* 66, 1940 (645–53).

A brief historical sketch is given of the Sal forests of Kamrup Division, Assam, with particular reference to measures for securing the establishment of regeneration. The method now in use consists of regeneration fellings by the uniform system combined with controlled burning and rains tending, i.e. cutting back evergreens and hand-pulling *Eupatorium odoratum*. Non-Sal species are thinned out uniformly with the Sal, instead of being felled wholesale as in the past. Results have been highly successful. Experience of canopy manipulation and rains tending in Assam agrees with that gained in the United Provinces [cf. *For. Abs.* 1 (254); 2 (130, 206)], but observations by the present author suggest that grazing may be as important as, or possibly more important than, controlled burning as a means of keeping down the growth of *Imperata cylindrica* sufficiently to secure the establishment of Sal seedlings. This view is discussed and the need is urged for detailed experiments to settle the matter.

## 23.2. *Artificial Formation of Stands. Artificial Regeneration*

### 23.21. Choice of Species

23.21 : 12.15. PARKER, R. N. **The introduction of exotics.** *Indian For.* 66, 1940 (639–45).

A general discussion of the possible utility of exotic species, their limitations, and the principles that should govern their selection and trial.

### 23.22. Tools for [and Methods of] Cultural Work

23.22:12.2:11.48–9 : 23.5. HILF, H. H. Der Einfluss der Bodenbearbeitung auf das Wachstum von Laubholz auf armen Sandböden. **[The influence of soil treatment on the growth of hardwoods on poor sandy soils.]** *Forstarchiv* 16, 1940 (96–104). [G.] Biol. Abs. 14 (15343).

Two-year-old plants of Birch, Alder, and Mountain Ash were planted under open 110-year-old Pine on poor sandy soil, some in spots prepared by removing the ground cover and loosening the soil, some on soil hacked with a cultivator, and some on soil both hacked and ploughed. At the end of two growing seasons the plants on ploughed land were about twice as high as those on the spots, while those on hacked unploughed land were intermediate. Birch grew much faster in a 60-cm. ploughed strip than in 60 × 60 cm. prepared spots.

### 23.23. Sowings

#### 23.23.1. *Seed Procurement, Treatment, and Testing*

23.23.1 : 12.2 : 23.1. ISAAC, L. A. **Life of seed in the forest floor.** *For. Res. Note Pacif. Nthwest. For. & Range Exp. Sta.* No. 31, 1940 (14).

Good-quality seed stored in the forest floor was tested the first spring after seed fall and the following germination per cents. were obtained: Douglas Fir 32·5, Western Hemlock 3·8, Western Red Cedar 3·5, Ponderosa Pine 63·0, Western White Pine 9·8, Sitka Spruce 96·8, Port Orford White Cedar 1·0, Noble Fir 7·4. Further tests showed that there is practically no germination of seeds of these species after the first year.

23.23.1 : 12.2. WEAN, R. E., and GUARD, A. T. **The viability and collection of seed of *Liriodendron tulipifera* L.** *J. For.* 38, 1940 (815–7). [Purdue University.]

From examination of several hundred seeds it is concluded that if endosperm tissue is found an embryo is present. The low germination capacity of this species appears to be due mainly to the absence of embryos, probably as a result of abortion following fertilization. Only 19·08 per cent. of seeds examined contained embryos, the seeds in the basal ring of the cone having the lowest percentage (1·83) followed by the tip-most seeds with about 5 per cent., while 19–21 per cent. of the seeds in the third to seventh spirals showed endosperm tissue. Low or relatively high production of viable seed may be consistent characteristics of individual trees.

### 23.23.3. *Methods of Sowing*

23.23.3 : 12.2. LAURIE, M. V. **Note on the germination of *Scaphula* (*Anisoptera*) *glabra*.** *Indian For.* 66, 1940 (653–4).

When seed of *Scaphula glabra* is sown with the wings upwards a reasonable initial germination is obtained, but the radicles twist and curl and many die back before they can enter the soil; thus a high percentage of casualties occurs, and the survivors are badly contorted. Experiments at Dehra Dun showed that clipping the wings and sowing the seed upside-down produced a higher percentage of survivals and stronger, straighter seedlings.

## 23.24. Formation of Crops (Stands) by Planting

### 23.24.1. *Planting Material*

23.24.1. HETZEL, J. E. **Some recent improvements in the transportation and storage of planting stock in the field.** *Occ. Pap. Allegh. For. Exp. Sta.* No. 2, 1940. pp. 4 + 3 plates.

Description of three devices for improving the transport and storage conditions of planting stock after leaving the nursery, i.e. (1) a collapsible crate 20 in. × 20 in. × 30 in. for shipping planting stock, (2) a central heeling-in bed that combines the advantages of adequate water supply and shade, proper soil mixture, and maximum efficiency in protection and distribution of stock, and (3) the Allegheny planting-stock basket, which is made of 19-gauge, ½-in. mesh hardware cloth on a frame of ⅛-in. × 1-in. strap iron and is used for transporting stock from the central heeling-in bed to the planting crew.

### 23.24.2-3. *Methods of Planting*

23.24.2–3 : 12.2. HISLOP, J. J. **The effect of good, moderate and bad planting on the subsequent development of a conifer, with special reference to Pines and Larch.** *Scot. For. J.* 54, 1940 (52–62).

The factors governing root development are considered as a basis to the rules for successful planting. The methods commonly in use for planting conifers in Britain are discussed and the need for selecting the one suitable to local conditions is emphasized, with particular reference to subsequent treatment of the plantation. Detailed recommendations are given for the planting of the common Pines and Larches.

## 23.26. Plant Rearing. Nursery Practice

### 23.26.2. *Rearing of Individual Species*

23.26.2 : 21.5 : 12.2. SAHI, S. P. **The propagation of *Bombax malabaricum* from root-sections.** *Indian For.* 66, 1940 (600–2). [Forest Research Institute, Dehra Dun.]

Sections, 1–3 in. long, cut from the roots of 1-year-old nursery stock and planted in moist sand, produced roots and shoots and a number of them developed into vigorous plants. Sections from the middle and upper parts of the root grew more vigorously than those from the lower end.

23.26.2 : 12.2 : 21.2. LI, Y.-C. **Watering germinating seedbeds.** *J. For.* 38, 1940 (897–8). [Szechuen Provincial Agricultural Improvement Institute, Chengtu, China.]

It is concluded that germination of both Red Pine and Jack Pine is best with moderate watering of about 1 in. every 5 days. Of the two species Red Pine requires more water for germination and early development while Jack Pine has an earlier and shorter germination period.

23.26.2 : 21.5 : 12.2. STEAVENSON, H. A., and DODGE, A. F. **Handling Willow and Cottonwood cuttings.** *Tech. Suppl.* to *Progress Exchange*, July 18, 1940. pp. 3. [Soil Conservation Service, U.S.D.A.]

As a result of nursery experiments in the Upper Mississippi Region during 1936–9, a technique is recommended for propagating *Salix longifolia*, *S. nigra*, and *Populus balsamifera* by means of cuttings.

### 23.26.5. *Treatment with Growth Substances*

23.26.5 : 21.5. HU, T. C. **The rooting of certain economic plants by auxin treatment.** *Science, China* 24, 1940 (288–96). [Chin.e.] L.S.

The accompanying table gives the best treatments for 8 Chinese woody species (IA = indole-acetic, IB=indole-butyric, NA=naphthalene-acetic acid).

| Species | Auxin concentration mg/cc. × $10^{-5}$ | | Time of treatment in hours | Temp. °C. | Time for rooting in days | Percentage rooting | Average roots per cutting |
|---|---|---|---|---|---|---|---|
| *Fraxinus chinensis* | NA | 5 | 24 | 23 | 40 | 88 | 30 |
| *Sapium sebiferum* | IB | 10 | 24 | 25 | 48 | 83 | 17 |
| *Ligustrum lucidum* | IA | 40 | 24 | 24 | 46 | 80 | 11 |
| | NA | 5 | 24 | 24 | — | 80 | 10 |
| *Prunus persica* | IA | 20 | 24 | 23 | 26 | 66 | 12 |
| | NA | 5 | 24 | 23 | — | 66 | 6 |
| *Punica granatum* | IA | 40 | 24 | 24 | 36 | 63 | 23 |
| | NA | 5 | 24 | 24 | — | 75 | 25 |
| | IB | 10 | 24 | 24 | — | 75 | 21 |
| *Morus australis* | IB | 2 | 24 | 23 | 21 | 88 | — |
| *Populus yunnanensis* | IA | 2 | 24 | 18 | 14 | 100 | — |
| *Jatropha curcas* | IA | 80 | 24 | 25 | 21 | 75 | 6 |

23.26.5 : 21.5. GRACE, N. H. **Responses of plant cuttings to treatment with naphthyl acids and their potassium salts in a talc carrier.** *Canad. J. Res.* 18, Sec. C, 1940 (457–68). [National Research Laboratories, Ottawa.] P.R.

Cuttings of one herbaceous and of four dormant woody plants were treated with a series of talc dusts containing indolylacetic acid and the acids and potassium salts of several members of the naphthyl series of root growth stimulating chemicals. The higher members of the series compared favourably with naphthylacetic acid in respect to most of the responses considered, though there were indications that naphthylacetic acid or its salt had a greater effect on the number of roots per rooted cutting. Naphthylacetic and 1-$\gamma$-naphthylbutyric members of the series were equally effective as acids or salts; however, a mixture of the isomeric 1- and 2-$\gamma$-naphthylbutyric acids was more active than the corresponding mixture of salts. Conversely, potassium naphthylhexoate appeared to have greater activity than the acid. The results suggest that pure naphthylbutyric acid, the isomeric mixture of acids, and potassium naphthylhexoate are virtually as effective as the recognized plant growth stimulating chemicals, indolyl- and naphthylacetic acids.

A noteworthy feature of the results was the beneficial effect of treatment with talc alone. The promotion of new growth and rooting of dormant cuttings were of particular interest, though most of the other criteria studied also indicated beneficial responses. *Author's summary.*

23.26.5 : 21.5 : 12.2 : 23.26.2. DEUBER, C. G. **Vegetative propagation of conifers.** *Trans. Conn. Acad. Arts Sci.* 34, 1940 (1–83). [Yale University.]

(i) Norway Spruce [*Picea abies* (*excelsa*)]: Rooting of cuttings from 40-year-old trees varied greatly with season of collection, increasing rapidly in late autumn to a maximum (over 80 per cent.) in December and again declining during the spring. Cuttings from 5-year-old trees of this species and from 2-year-old trees of *P. glauca* showed less seasonal variation, rooted more quickly, and gave a higher percentage of rooting. Treatment with indole-butyric and indole-acetic acids caused no consistent or highly significant increase in rooting. Propagation in sand at warm greenhouse temperatures assured root formation within 100 days in the winter. When collected in May, disbudded cuttings rooted better than intact ones. Cuttings from trees infested with Spruce gall aphid generally rooted less than those from uninfested trees. There was a marked clonal variation in the rooting capacity of cuttings from older trees, and the types of initial root system produced by various clones also varied considerably. (ii) Eastern White Pine (*Pinus strobus*): Dormant cuttings rooted better than summer cuttings, but there was no marked seasonal trend in winter. Cuttings from younger trees, especially from seedlings 2–4 years old, rooted to a greater extent and more consistently than those from older trees. No consistent or highly significant benefit was gained by treatment with indole-butyric acid or similar substances. Removal of the lower needles and waxing the cuttings both proved to be detrimental. Small cuttings 2–4 in. long, taken from lateral shoots, survived better and rooted more abundantly than larger ones, especially those from terminal shoots. Superior results were obtained when the resin exuding

at the base was not removed. Sand was the best propagating medium, and warm greenhouse temperature following a brief pre-callusing period in a 'sweat bench' was better than continuous 'sweat-bench' or cold-room environments. Evidence was found of clonal variation in the rooting capacity of cuttings from older trees. (iii) Red Pine (*P. resinosa*): No rooting occurred in the limited trials made. (iv) Lace-bark Pine (*P. bungeana*): A January collection from a 10-year-old tree gave 52·5 per cent. rooting in sand under warm greenhouse conditions. (v) Japanese Red Pine (*P. densiflora*): A December collection from a 15-year-old tree gave 25·7 per cent. rooting in cuttings from branches with female cones, and 17·1 per cent. rooting in those from coneless branches. (vi) Hemlock (*Tsuga canadensis*): Cuttings from 4-year-old trees gave a higher rooting percentage than those from 20-year-old trees. Dust treatments with indole-butyric acid significantly increased rooting in cuttings from both ages of tree. Vitamin $B_1$ improved the growth of stems and roots in rooted cuttings of this species, but not in Norway Spruce.

23.26.5 : 21.5 : 12.2. Grace, N. H., Farrar, J. L., and Hopkins, J. W. **Vegetative propagation of conifers. VII. Outdoor propagation of a November collection of Norway Spruce cuttings treated with phytohormones, cane sugar, and an organic mercurial disinfectant.** *Canad. J. Res.* 18, Sec. C., 1940 (566–77). [National Research Laboratories, Ottawa.] P.R.

Dormant Norway Spruce cuttings were collected in mid-November and treated with talc dusts containing two separate phytohormone chemicals, indolyl-acetic and naphthyl-acetic acids, in three concentrations, 0, 1,000, and 5,000 p.p.m., alone, and in combination with cane sugar and an organic mercurial disinfectant. Treated cuttings were planted immediately in outside frames in sand and a mixture of sand and peat in equal proportions. They were removed for examination 10 months later. Phytohormone treatment, except with the 5,000 p.p.m. concentration of naphthyl-acetic acid, which was injurious, increased the number of cuttings rooted, the number and length of roots, the number of surviving cuttings, and the number of rooted cuttings with new growth. There were also marked effects on the initiation and development of new growth. The admixture of peat in the propagation medium improved rooting and development of new growth, particularly in certain of the phytohormone treatments. Only about 50 per cent. of the controls rooted in both sand and sand-peat, while the 5,000 p.p.m. concentration of indolyl-acetic acid effected 18 per cent. rooting in sand and 82 per cent. in sand-peat.

Both cane sugar and organic mercury significantly affected a number of the responses. However, the effects were comparatively small and depended, for the most part, on interactions with phytohormone treatments and media. Organic mercury increased the number of cuttings rooted by about 6 per cent. *Authors' summary.*

23.26.5 : 21.5 : 12.2. Doran, W. L., Holdsworth, R. P., and Rhodes, A. D. **Propagation of White Pine by cuttings.** *J. For.* 38, 1940 (817). [Massachusetts Agricultural Exp. Sta.]

The best rooting (70 per cent.) was obtained by treating cuttings from the lower part of the tree with the strongest solution of indole-butyric acid tested (200 mg. per l.) for the shortest time (5 hours). All cuttings were taken in the late winter and consisted of wood produced during the previous summer. Treatment of the cuttings with sucrose before treatment with indole-butyric resulted in the cuttings living longer, whether rooted or not.

### 23.26.9. *Methods of Manuring or Fertilizing [other than Composting]*

23.26.9 : 12.2. Wilde, S. A., Wittenkamp, R., Stone, E. L., and Galloway, H. M. **Effect of high rate fertilizer treatments of nursery stock upon its survival and growth in the field.** *J. For.* 38, 1940 (806–9). [University of Wisconsin, Madison.]

Nursery soil of average fertility was given heavy applications of a balanced nitrogen/phosphorus/potash fertilizer, at rates up to 1,100 pounds per acre of total salts, the fertilizer being applied broadcast and in solution. Two-year-old Jack Pine, Red Pine, and Scotch Pine seedlings from fertilized and check plats were transplanted on podzolic outwash sandy loam. An average increase in survival of fertilized stock varied from 10 to 15 per cent., at the end of the third growing season for Jack Pine and at the end of the second season for Scotch and Red Pine, but this was not considered significant owing to the variability among individual sample plats. The average increase in height growth varied from 20 to 30 per cent. in favour

of fertilized stock, and was found to be statistically significant. Spring planting resulted in somewhat better survival and height growth than the fall planting. *From authors' summary.*

## 23.7. *Slash Disposal. Clearing of Site*

23.7 : 43.1 : 23.13 : 92 (71.1). TERNAN, C. C. **Slash disposal—its merits and faults.** *B. C. Lumberm.* 24 (11), 1940 (27–8).

Discussion of the objections to and advantages of slash disposal and snag felling under the logging conditions in British Columbia, particularly in the Douglas Fir region, and of the legislation and administration related to this problem. Slash is burned once a year early in the fall and snags must be down before 31st December of each calendar year. Of an estimated area of 55,000 acres logged in 1939, 51,000 were slash-burned.

# 24. TENDING OF STANDS AND TREES

## 24.2. *Thinnings*

24.2 : 12.2 (54.5). KITCHINGMAN, G. D. **Thinnings in the Punjab coniferous forests.** *Emp. For. J.* 19, 1940 (243–52).

A description of the standard methods now used in pure and mixed forests of Deodar (*Cedrus deodara*), Kail (*Pinus excelsa*), Chir (*P. longifolia*), Spruce (*Picea morinda*) and Fir (*Abies pindrow*).

24.21 : 24.31. BOTTENBURG, M. VAN. Het vergiftigen van boomen. **[The poisoning of trees.]** *Tectona* 33, 1940 (452–64). [Du.e.]

The history of poison girdling in Malaya is reviewed. Since 1937, the poisoning of trees with sodium arsenite has been in use for improvement fellings in the East Coast District of Sumatra.

24.21 : 34.26 : 12.2. **Killing Rubber trees with sodium arsenite.** *Rubb. Res. Inst. Malaya Plant. Bull.* No. 13, 1940 (7–8).

Satisfactory frills can be made with a sharp, fairly heavy axe if cuts are 1–2 in. deep and well overlapped. An application of one pint of a solution of 5 lb. of sodium arsenite in 1 gal. of water per tree should be effective.

24.25 : 12.2. KACHIN, T. **Ponderosa Pine sapling stand responds to thinning.** *For. Res. Note Pacif. Nthwest. For. & Range Exp. Sta.* No. 31, 1940 (13).

Although thinning to a 6 × 6 ft. spacing resulted in heavy mortality through snow-break, it also brought about a significant net increase in growth. Extensive snow damage suggests that residual trees should be selected for characteristics to withstand this hazard rather than to satisfy strict spacing requirements.

## 24.3. *Opening of the Canopy. Release and Improvement Cuttings*

24.3 : 12.2. PUTNAM, J. A., and BULL, H. **Improvement cuttings in the bottomland hardwood forests of Mississippi.** *Sth. Lumberm.* 161 (2033), 1940 (203–7). [Southern Forest Exp. Sta.]

These forests are in special need of improvement cuttings owing to their great mixture of species, some of which are practically valueless. Preliminary suggestions are made regarding cutting methods and the probable benefits of improvement cuttings are discussed.

## 24.4. *Shelterbelts. Windbreaks*

24.4. SMITH, L. F. **Windbreaks for Kansas farmsteads.** *Circ. Kans. agric. Ext. Serv.* No. 140, 1940. pp. 32.

A popular guide to windbreak planting and maintenance under Kansas conditions. The planning of windbreak lay-out is considered with special reference to farmstead protection, but notes are also included on shelterbelts for gardens and orchards that are situated outside farmsteads.

## 24.5. *Pruning*

24.5. LAURIE, M. V. **Pruning in plantations.** *Indian For.* 66, 1940 (699–710).

As pruning has so far received little attention in India, there is need for research to determine the merits or demerits of pruning Indian trees. The present paper enumerates and discusses, with brief reference to European experience, the large number of factors that must be considered in such investigations.

24.5 : 07.7. CURTIS, J. D. **Comments on the Hebo pruning club.** *J. For.* 38, 1940 (813). [University of Maine.]

Criticism of the efficiency of this implement with reference to tree damage and rate and quality of healing of the branch scar. [Cf. *For. Abs.* 2 (216).]

24.5 : 12 2. MCLINTOCK, T. F. **Effect of intensity of pruning on sprout formation in young planted Pitch Pine.** *Tech. Note*

*Cent. St. For. Exp. Sta.* No. 21, 1940. pp. 3. [Civilian Conservation Corps.]

The degree of sprout development following the pruning of six-year-old planted Pitch Pine was found to be conditioned by the relative severity of pruning, sprout formation on heavily pruned trees being up to fourteen times as dense as on lightly pruned trees.

## 3. FOREST UTILIZATION.

3 : 09.7 (59.5). DESCH, H. E., and THOMAS, A. V. **Timber utilization in Malaya.** *Malay. For. Rec.* No. 13, 1940. pp. 75 + v.

The bulk of the matter contained in this Record is compiled from various earlier articles by one or other of the two authors in *The Malayan Forester* and elsewhere. The following chapters are included: (1) The forests of the Malay Peninsula and their exploitation; (2) The anatomical structure of wood; (3) Identification and classification of Malayan timbers; (4) The seasoning of timber; (5) Defects; (6) Wood preservation; (7) The mechanical properties of timber; and (8) Design in relation to correct utilization of timber in new buildings. The chief purpose of this Record is to provide local timber users with the minimum of information necessary for the correct use of Malayan timbers under Malayan conditions.

### 31. PROPERTIES AND ANATOMY OF WOOD

31 : 33 : 12.2. **The properties of Australian timbers. Yellow Stringybark (*Eucalyptus muelleriana* Howitt).** *Mon. News Lett. Div. For. Prod. Aust.* No. 100, 1940 (3).

31 : 33 : 12.2. **The properties of Australian timbers. Silver-top Ash (*Eucalyptus sieberiana* F. v. M.).** *Mon. News Lett. Div. For. Prod. Aust.* No. 106, 1940 (3).

31 : 33 : 12.2. **The properties of Australian timbers : Grey Satinash (*Eugenia gustavioides* Bailey).** *Mon. News Lett. Div. For. Prod. Aust.* No. 105, 1940 (4).

31 : 33 : 12.2. EVERLEY, H. E. **Appalachian Yellow Poplar [*Liriodendron tulipifera*] for fine painted or enamelled woodwork.** *Sth. Lumberm.* 161 (2033), 1940 (121–3).

31 : 33 : 12.2. SCOTT, M. H. **An interloper from Brazil.** *J. S. Afr. For. Ass.* No. 5, 1940 (29–31). [Forest Products Institute, Pretoria.]

The wood of a Brazilian species *Phoebe porosa*, known commonly as Canella Imbuia, or as Brazilian Walnut on the American market, closely resembles the South African Black Stinkwood (*Ocotea bullata*) except for the decided and spicy odour of the former species.

## FOREST TECHNOLOGY

The properties and working qualities of the Brazilian species are noted and the main points of difference between the two species are recorded from microscopic examination.

### 31.1. *Structure. Anatomy. Identification*

31.1 : 11.2 : 09.2. SAMPSON, A. W. **The dendrochronology enigma.**—With comments by H. H. Chapman. *J. For.* 38, 1940 (966–8). [University of California.]

While correlation between annual tree growth, as measured by ring width, and annual precipitation records is frequently positive, the use of ring-width measurements as an indication of otherwise unrecorded climatic history is not justified, particularly in areas where rainfall is not a limiting factor, as many other environmental factors may have as strong or stronger correlation with ring width. Chapman points out that where water is limiting its scarcity is probably the most potent factor in reducing the average width of rings, and under these conditions the tree ring does accurately record variations in rainfall.

31.1 : 12.11. GILBERT, S. G. **Evolutionary significance of ring porosity in woody angiosperms.** *Bot. Gaz.* 102, 1940 (105–20). [Rutgers University, New Brunswick, New Jersey.] O.B.D.

The xylem of trees whose adult stem is ring-porous was found to be predominantly diffuse-porous in the seedling, first annual ring, root, and reproductive axis, thus confirming the theory that diffuse-porosity is the more primitive condition. Further confirmation is afforded by the high degree of correlation found to exist between the ring-porous condition and the presence of other anatomical features that are acknowledged as advanced, such as simple perforation of the end wall of vessel segments, paratracheal wood parenchyma, and the occurrence of only simple pits in the wood fibres. The evolutionary significance of these findings is discussed with particular reference to the fact that ring-porosity is apparently limited, even within the same genus, to the North Temperate zone.

31.1 : 12.2. CHOWDHURY, K. A. **The formation of growth rings in Indian trees. Part II. (a) Champ (*Michelia champaca*), (b) Kokko (*Albizzia lebbek*), (c) Sissoo (*Dalbergia sissoo*), (d) Toon (*Cedrela toona*).** *Indian For. Rec.* (*n.s.*) *Utilization* 2, 1940 (41–57). [Forest Research Institute, Dehra Dun.]

Annual growth rings are present in all the four species, are distinct in Champ, fairly distinct in Toon, and not always easily detectable in Kokko and Sissoo. There seems to be no relation between the deciduous and evergreen habits of trees and the formation of growth rings in their timbers. None of the four species has shown diameter growth in the trunk before half of the crown was covered with new foliage. The progress of growth in the ring-porous wood of Toon has shown two distinct periods; usually fast growth is followed by slow growth in each period. In the diffuse-porous woods of Champ, Kokko, and Sissoo, there is only one period of fast growth, preceded and followed by periods of slow growth. None of the species has shown any resting period in the middle of the active growth season. The external and internal factors which control the growth activities in trees are discussed in brief. It is pointed out that existing knowledge on the subject is so incomplete that no final conclusion can be drawn at present. [Cf. Part I of the investigation, *For. Abs.* 1, pp. 171–2.]

31.1 : 12.2. **The identification of Douglas Fir wood.** *Tech. Note For. Prod. Lab., Wis.* No. 198, [revised ed.] 1940. pp. 2.

The general distinctive characteristics of this wood are briefly noted, as are those of the other principal softwoods that may be used for the same purposes.

31.1 : 31.22 : 12.2. TURNBULL, J. M. **Fibril behaviour as disclosed by shrinkage observations.** *J. S. Afr. For. Ass.* No. 5, 1940 (62–72). [Forest Products Institute, Pretoria.]

Shrinkage measurements taken on specimens of *Pinus patula* disclose a close inverse relationship between longitudinal and transverse shrinkage, indicating that their ratio is a function of fibril inclination. The ratio, in drying from air dry to oven dry, is found to double, thus suggesting a slight independent twisting in individual fibres, the implications of which in connexion with spiral growth are discussed. A relatively high ratio along the longer radii of eccentric stems, it is contended, is associated with a tendency for pressure wood to develop on the side of stimulated growth. Density appears to exert no direct influence on the ratio. An analysis of the basic data is used in an attempt to explain how the moisture gradient across stems at fibre saturation points is controlled. A suggested association between internal stress variations and fibril behaviour is also discussed. *Author's summary.*

31.1 : 31.3. DADSWELL, H. E., and ELLIS, D. J. **Contributions to the study of the cell wall. 2. An investigation of delignification using thin cross sections of various timbers.** *J. Coun. sci. industr. Res. Aust.* 13, 1940 (129–37). (*Repr. Div. For. Prod. Aust.* No. 72). [Division of Forest Products, Australia.]

The effects of various methods of delignification were tested at intervals by staining and by treatment with sulphuric acid. Staining with safranin and light green gives a reliable indication of 'lignification' provided that the sections are of standard thickness and are not subjected to any pre-treatment. There was no indication that the cell wall lignin was removed before or after that from the 'middle lamella', but there is more to be removed from the latter. Sections delignified by chlorination can be prevented from macerating by washing at intervals with a 3 per cent. alcoholic solution of ethanolamine. Such sections must be considered as holocellulose, with the cells held together by some cementing material other than lignin.

31.1 · 31.3 : 12.2. HARLOW, W. M. **Contributions to chemistry of plant cell wall.** *Paper Ind.* 22, 1940 (150). [New York State College of Forestry.] L.S.

Sections 3–5$\mu$ thick, taken from wood of several conifers, gave much less distorted structural patterns when treated with 72 per cent. sulphuric acid or Schweitzer's reagent than did thicker sections, presumably owing to a reduction in lateral pressure resulting from the greater opportunity for upward and downward swelling of the secondary walls.

## 31.2. *Physical Properties*

### 31.22. Relation to Water, Air, Gases

31.22 : 33.9 : 12.2. RIETZ, R. C. **Variation in equilibrium-moisture-content in a typical large Douglas Fir storage shed.** *W. Cst. Lumberm.* 67 (12), 1940 (30–2). [Forest Products Laboratory, Madison, Wis.]

An instrument, known as a sliver machine, has been developed to indicate equilibrium-moisture-content conditions. Its use is described in a study of the variations in the equilibrium moisture content at different levels within a lumber storage shed and, for purposes of comparison, outdoors. It is concluded that lumber, kiln-dried to a 10-per-cent. moisture content and stored under the conditions studied, would be subject to moisture regain the year around. The possibilities are examined of maintaining the shed at a constant equilibrium moisture content by heating.

## 31.27. Mechanical Strength and Resistance

31.27. THOMAS, A. V. **Malayan timbers tested in a green condition.** *Malay. For.* 9, 1940 (151–7).

A comprehensive table is given of the strength properties of 33 Malayan timbers in the green condition, and corresponding figures for Scots Pine, Oak, and Teak, are appended for comparison. The data are not intended as a direct guide to allowable working stresses, but tentative correction factors for this purpose are included.

31.27 : 33.4. **Safe strength of wooden beams.** *Pulp Paper Mag. Can.* 41, 1940 (832–3).

A chart for use in checking the safety of beams, or in determining an unknown factor relating to the dimensions and safe load of beams of common woods.

31.27 : 33.4 : 33.15. NEWLIN, J. A. **The designing for strength of flat panels with stressed coverings.** Forest Products Laboratory, Madison, Wis. No. *R*1220, 1940. pp. 7.

31.27 : 35 : 33.4. WILSON, T. R. C. **Supplement to U.S. Department of Agriculture Miscellaneous Publication 185: 'Guide to the grading of structural timbers and the determination of working stresses'.** Forest Products Laboratory, Madison, Wis. No. *R*1225, 1940. pp. 11. P.R.

## 31.3. *Chemical Properties*

31.3. FISHER, J. H., HAWKINS, W. L., and HIBBERT, H. **Lignin and related compounds. XLVII. The synthesis of xylosides related to lignin plant constituents.** *J. Amer. chem. Soc.* 62, 1940 (1412–5). Chem. Abs. 34 (6249). P.R.

31.3 : 12.2. ANDERSON, E., SEELEY, M., STEWART, W. T., REDD, J. C., and WESTERBEKE, D. **The origin and composition of the hemicelluloses obtained from hardwoods.** *J. biol. Chem.* 135, 1940 (189–98). Chem. Abs. 34 (6812). P.R.

31.3 : 12.2. : 33.32. MITCHELL, R. L., and RITTER, C. J. **Composition of hemicellulose isolated from Maple wood.** *J. Amer. chem. Soc.* 62, 1940 (1958–9). Chem. Abs. 34 (6447–8). P.R.

31.3 : 12.2. MACKNEY, A. W. **A study of the alkaline extraction of wood. 1. The effects of hot alkaline treatment on *E.* [*Eucalyptus*] *regnans* F. v. M.** *J. Coun. sci. industr. Res. Aust.* 13, 1940 (115–28). (*Repr. Div. For. Prod. Aust.* No. 71).

Just sufficient sodium hydroxide to maintain an alkaline reaction at the end of the treatment is shown to be a satisfactory preliminary to lignin determination. The lignin of this species consists of two fractions differing in solubility in sodium hydroxide. The conditions governing the removal of the fibre-cementing material were determined and in addition to this material there was found to be in holocellulose about 5 per cent. of a non-cellulosic non-furfural-yielding carbohydrate. The constitution and yield of Cross and Bevan cellulose are shown to vary with the nature of the alkali pre-treatment and an attempt is made to explain these variations.

31.3 : 12.2. WIECHERT, K. **Lignin colour reactions of raw Beechwood.** *Papierfabrikant* 37, 1939 (17–24, 30–1). [G.] B.C.P.A. 1940, B (729–30). P.R.

31.3 : 12.2. HIRST, E. L., JONES, J. K. N., and CAMPBELL, W. G. **The ε-galactan of Larch wood.** *Nature, Lond.* 147, 1941 (25–6). [Forest Products Research Laboratory, Princes Risborough, Bucks.]

31.3 : 12.2. FREUDENBERG, K., LAUTSCH, W., and ENGLER, K. **Lignin. XXXIV. Formation of vanillin from Spruce lignin.** *Ber.* 73 (B), 1940 (167–71). B.C.P.A. 1940, A II (352). P.R.

31.3 : 12.2. LAUTSCH, W., and PIAZOLO, G. **Lignin. XXXV. Oxidative degradation of halogen-substituted Spruce lignins.** *Ber.* 73B, 1940 (317–20). Chem. Abs. 34 (6064). P.R.

31.3 : 12.2. HACHIHAMA, Y., ZYODAI, S., and UMEZU, M. **Lignin and related compounds. I. Hydrogenation of soft-wood lignin.** *J. Soc. chem. Ind. Japan* 43, 1940 (127B). B.C.P.A. 1940, A II (352). P.R.

31.3 : 12.2. PENISTON, Q. P., MCCARTHY, J. L., and HIBBERT, H. **Lignin and related compounds. L. Fractionation of acetylated cell-wall constituents of Red Oak wood.** *J. Amer. chem. Soc.* 62, 1940 (2284–8). Chem. Abs. 34 (7599–600). P.R.

31.3 : 33.32. BAILEY, A. J. **The heterogeneity of lignin.** *Paper Tr. J.* 111 (7), 1940 (27–30). [University of Washington, Seattle.] P.R.

31.3 : 33.32. BAILEY, A. J. **Preparation and properties of butanol lignin.** *Paper Tr. J.* 111 (6), 1940 (27–30). [University of Washington, Seattle.] P.R.

31.3 : 33.32. BRAUNS, F. E. **Recent advances in the chemistry of lignin.** *Paper Tr. J.* 111 (14), 1940 (33–9). [Institute of Paper Chemistry, Appleton, Wis.] P.R.

A discussion of the recent advances in the chemistry of lignin, thiolignin, and their derivatives.

31.3 : 33.32 : 34.6. HARRIS, E. E. **Utilization of waste lignin. Current chemical research.** [A review]. *Industr. Engng. Chem.* (Industr. Ed.) 32, 1940 (1049–52). [Forest Products Laboratory, Madison, Wis.] P.R.

## 31.4. *Durability. Decomposition*

### 31.42. Attack by Plant Organisms

31.42 : 11.44. FINDLAY, W. P. K. **Studies in the physiology of wood-destroying fungi. III. Progress of decay under natural and under controlled conditions.** *Ann. Bot., Lond.* (*n.s.*) 4, 1940 (701–12). [Forest Products Research Laboratory, Princes Risborough, Bucks.]

The progressive loss in weight of wood decayed under controlled conditions by pure cultures of wood-rotting fungi was followed. It was found that the white rot caused by *Polystictus versicolor* can completely destroy samples of Beech wood in two years. On the other hand, brown rots caused by fungi such as *Coniophora cerebella*, *Merulius lacrymans*, or *Lenzites trabea*, which leave the lignin virtually unattacked, cannot remove more than about 70 per cent. of the wood substance.

Investigations have been carried out to determine the effect on the rate of decay of wood by brown and white rot fungi, of exposing it first to preliminary rotting by a fungus causing a different type of decay. It was found that preliminary rotting of Beech with a white rot increases the subsequent rate of decay by a brown rot fungus. The significance of these results is discussed in relation to the decay of fallen timber and the supply of humus to a forest soil. *Author's summary.*

31.42 : 33.51 : 12.2 : 33.9. **Railroad tie decay, comprising 'The decay of ties in storage',** by C. J. Humphrey, **and 'Defects in cross-ties, caused by fungi',** by C. A. Richards. American Wood-Preservers' Association, Washington, D.C. 1939. pp. 55. [Bureau of Plant Industry, U.S.D.A.]

The first paper deals with the fungi that commonly attack stored hardwood and Pine sleepers in the central United States, and is meant mainly as a guide for yard inspectors. The second paper contains a brief general discussion of heartwood rots in living trees and of decay in sleepers as affected by this and by infection during storage or after the sleepers are laid.

31.42 : 33.52 : 04. ZUCKER, M. **The technique of inspecting wood poles by X-ray.** American Society for Testing Materials, Philadelphia. *1940 Preprint* No. 109, 1940. pp. 7. [Detroit Edison Co., Detroit, Mich.] P.R.

A fuller account of the technique of X-raying poles as reported in *For. Abs.* 2 (153). Descriptions are given of the equipment used and of the methods of analysing radiographs for rot and the effect of rot upon pole strength. It is suggested that the X-ray method might also find uses in the examination of other forms of converted timber and of standing trees.

### 31.43. Attack by Animal Organisms

31.43 : 13.2 : 09.4 (485). TRÄGÅRDH, I. **Second survey of the wood-destroying insects in public buildings in Sweden.** *Bull. ent. Res.* 31, 1940 (287–94). [Royal Swedish Institute of Experimental Forestry.]

With reference to Svealand, the central part of Sweden. Insect injuries were recorded in 43·8 per cent. of the buildings and the principal species reported were *Hylotrupes bajulus*, *Callidium violaceum*, *Ernobius mollis* and *Anobium striatum.*

31.43 : 13.2 : 31.42. FISHER, R. C. **Studies of the biology of the death-watch beetle, *Xestobium rufovillosum* de G. III. Fungal decay in timber in relation to the occurrence and rate of development of the insect.** *Ann. appl. Biol.* 27, 1940 (545–57). Repr. [Forest Products Research Laboratory, Princes Risborough, Bucks.] P.R.

Timber attacked by wood-destroying fungi was shown to be more suitable to the development of *Xestobium rufovillosum* than sound or mould-infested timber, and there were indications that an increase in the extent of decay tended to shorten the life cycle, which ranges from one to ten years or more, according to environmental conditions. It is concluded that although temperature and humidity have an important effect on the rate of development of the beetle, the presence of decay finally determines the degree of suitability of the timber for infestation. *From author's summary.*

31.43 : 13.2 : 31.42 : 12.2 : 31.3. CAMPBELL, W. G., and BRYANT, S. A. **A chemical study of the bearing of decay by *Phellinus cryptarum* Karst. and other fungi on the destruction of wood by the death-watch beetle (*Xestobium rufovillosum* de G.).** *Biochem. J.* 34, 1940 (1404–14). [Forest Products Research Laboratory, Princes Risborough, Bucks.]

A chemical study of the decay of Oak sapwood by *Phellinus cryptarum* showed that the fungus produces a white rot of the kind in which all the major components of the wood are decomposed simultaneously. The food of *Xestobium rufovillosum* was shown to consist of extractives, cellulose, hemicellulose, and lignin. It was proved that there is no specific type of fungal decay that predisposes Oak wood to attack, and the fact that decayed wood is the commonest habitat of the beetle does not depend on the quantity or availability of any particular food substance resulting from fungal activity. It is concluded that the more favourable development of *Xestobium* larvae in decayed wood [cf. preceding abstract] is due mainly to the reduction of mechanical strength, decayed wood offering less resistance to boring than sound wood. The energy metabolism of the insect is discussed in relation to the food abstracted from the wood and the physical results of fungal decay.

31.43 : 31.3 : 12.2. BRIMBLECOMBE, A. R. **Determination of starch content of Spotted Gum trees.** *J. Aust. Inst. agric. Sci.* 6, 1940 (110–3). [Dept. of Agriculture & Stock, Brisbane.]

Description of an iodine method for visual estimation with the aid of a binocular microscope, claimed to be sufficiently precise for comparative purposes. *E. maculata* stores large quantities of starch in its sapwood and is therefore highly susceptible to *Lyctus* attack.

## 31.44. Injury by Chemicals

31.44 : 33.13 : 33.36. Étude de l'action de produits chimiques variés sur différents bois utilisés dans la construction des bacs et réservoirs dans l'industrie textile et chimique. [**A study of the action of various chemicals upon different woods used in the construction of vats and tanks in the textile and chemical industry.**] *Tiba, Paris* 17, 1939 (191–5, 255, 257–60, 314–7, 319–21). [F.f.] L.C.S.

Experiments are reported from the factory of Messrs. Lepers-Delourme Fils, Wasquehal (Nord), on the effect of 38 liquids on six timbers commonly used in the manufacture of wooden tanks, namely Cypress, Pitch Pine, Douglas Fir, Maple, Oak and Scots Pine. It was found that the first three species were the least attacked by chemical products, though tanks made from the other timbers could also be used to hold solutions commonly employed in chemical technology, provided the concentration of the solutions was moderate. Nitric acid and caustic soda had the most rapid and most harmful effect on wood. So-called acid-proof asphalt and tar coatings retarded the action of chemical substances to some extent, but the protection thus afforded was not complete.

## 31.45. Injury by Fire

31.45 : 33.4. BARNES, A. H. **Fallacies about fire resistance.** *Wood* 5, 1940 (267–9).

Results from a test of the relative combustibility of certain timbers placed them in the following order beginning with the least combustible—Karri (*Eucalyptus diversicolor*), Jarrah (*E. marginata*), Teak, Baltic Redwood (*Pinus sylvestris*), Douglas Fir, English Oak, Austrian Oak and Japanese Oak.

31.45 : 38 : 33.4. BARNES, A. H. **Fire-resisting doors.** *Wood* 5, 1940 (296–8).

A discussion of points relating to the construction and fitting of timber doors to be

effectively fire resistant. Suitable wooden doors not only check flames but also insulate the heat.

31.45 : 38 : 33.4. BARNES, A. H. **Fire-resisting structures: the merits of timber as a barrier to fire.** *Wood* 6, 1941 (7–9).

A general discussion dealing with fire-resisting paints; fire-proofing of timber through impregnation with chemicals; the covering of beams, &c. with a protective coating of cement or—as is frequently done in the U.S.A.—with a protective layer of wood; the fire-resistance of solid timber floors; the importance of preventing draught; and the creation of fire-resisting partitions. It is thought that asbestos paper sandwiched between two layers of boarding, while preventing draught, might also solve the problem of the fire-resisting wooden partition. The existing data on this and most other problems of increasing the fire-resistance of wooden structures are considered grossly inadequate. Solid timber floors are often advocated to be fire-resisting, but so far only one test has been carried out with such floors—in 1899 by the late British Fire Prevention Committee—and the results were not conclusive.

31.45 : 38 : 33.4. MCNAUGHTON, G. C., and MARTIN, T. J. **Fire tests on wood doors.** *American Builder & Building Age* Mar., 1940. pp. 3. Repr. [Forest Products Laboratory, Madison, Wis.] P.R.

Four types of wooden doors—two having solid cores of blocks of Ponderosa Pine, the third having a hollow unfilled core, and the fourth a hollow core filled with insulation—were tested under standard conditions in a fire-testing furnace. The doors with solid cores did not burn through in less than 40 minutes and in all cases completion of the test was prevented through failure of the frame or hardware or for some cause other than the burning through of the wooden door itself. The unfilled, hollow doors burned through in less than 10 minutes and, while the filled doors lasted 2 to 3 times as long, they did not show as much resistance as the solid wood doors.

## 31.8. *Defects of Timber*

31.8 : 56 : 07.7 : 12.2. KACHIN, T. **Effect of increment boring on Douglas-Fir.** *For. Res. Note Pacif. Nthwest. For. & Range Exp. Sta.* No. 31, 1940 (9–10).

It is concluded that a small area of wood near the hole is appreciably degraded but this is insufficient for one boring to have much effect on lumber values, although it is advised that repeat borings should be avoided. No evidence was found of wood-destroying fungi in the affected wood.

31.8 : 12.2. PHILLIPS, E. W. J. **A comparison of forest- and plantation-grown African Pencil Cedar (*Juniperus procera* Hochst.) with special reference to the occurrence of compression wood.** *Emp. For. J.* 19, 1940 (282–8). [Forest Products Research Laboratory, Princes Risborough, Bucks.]

Examination of discs taken at different heights from four trees of *Juniperus procera*, two grown in exposed conditions in the natural forest and two in a sheltered plantation, showed compression wood to be much more prevalent and its distribution more definitely related to the direction of the prevailing wind in trees grown in exposed natural forest than in material from a sheltered plantation. The plantation-grown timber was generally less hard and dense and paler in heartwood colour, but contained a larger proportion of sapwood. Observations are included on the structure and formation of growth rings in this species. *From author's summary.*

31.8 : 12.2. DAVIS, E. M. **Lumber from old-growth versus lumber from second-growth in *Pinus strobus*.** *J. For.* 38, 1940 (877–80). [Forest Products Laboratory, Madison, Wis.]

Of the eastern White Pine examined, the second-growth timber produced approximately one-fourth as much select lumber and one-half as much high-common lumber as did the old growth. The medium-common yield was about the same for both types, but the second-growth timber produced more than twice as much of the marginal low-common. Shake and decay were often the determining defects in old-growth low-common but were almost negligible in second growth. Knots were sounder in second growth than old growth, while for the common grades as a whole the knots averaged about twice as large in second growth, the low-common second growth being characterized chiefly by coarse knots. In order to reduce degrade from knot holes, kiln drying should be limited to the select and high-common grades. *From author's summary.*

31.8 : 31.21 : 33.4. KOEHLER, A. **More about loosened grain.** *Sth. Lumberm.* 161 (2033), 1940 (171–3). [Forest Products Laboratory, Madison, Wis.]

The causes of loosened grain are discussed and it is pointed out that the avoidance of excessive pressure in the working of wood, such as is caused by using dull tools, is essential in order to prevent this defect. Since grain loosens on the pith side only, the bark side should be made the face whenever choice is possible.

31.8 : 33.4 : 07.7. **Knot sealing as practised by the J. Neils Lumber Co., Klickitat, Wash.** *W. Cst. Lumberm.* 67 (10), 1940 (56).

A brief description of the machine and technique by which encased knots are glued firmly to the surrounding wood. A two-man crew can treat about 10,000 bd. ft. of the type of lumber processed.

## 32. HARVESTING OF WOOD. LOGGING

32 : 12.2. WROUGHTON, F. H. **Burma Teak and its extraction.** *J. S. Afr. For. Ass.* No. 5, 1940 (5–9).

A popular account of the wood, the country in which the tree is found, and the method of its extraction, with particular reference to the use of elephants in this work.

### 32.1. *Marking of Trees and Coupes*

32.1 : 22.14 : 12.2 : 34.27. LITTLE, E. L. **Suggestions for selection cutting of Piñon trees.** *Res. Note Sthwest. For. & Range Exp. Sta.* No. 90, 1940. pp. 3.

As the seeds, known as piñon nuts, are probably the most valuable products of *Pinus edulis*, and as some trees are consistently better nut producers than others, it is suggested that in selecting trees for wood production the poor nut-bearers should be cut. Light cuttings are desirable and only where reproduction is established.

### 32.2. *Felling. Extraction*

32.2. SKATA-EIRIK. Syrfällning. **[Summer felling and leaving trees to dry with crowns intact.]** *Skogsägaren* 16, 1940 (151–2). [Sw.]

This extract from the Finnish journal *Skogsbruket* gives further notes on 'syrfällning' [*For. Abs.* 2 (233)] and recommends the practice as a means of expediting the urgently needed hardwood fuel cuttings without greatly aggravating the summer labour shortage. Felling should not begin until the leaves have developed fully and hardened, as immature leaves curl up and check transpiration. The butts of the felled trees should be propped up on the stumps or on stones to prevent access to water as far as possible. Trees should be felled in the same direction, so that little overlapping of the crowns occurs. Experience from the Birch veneer industry, which employs the method as a means of securing enough natural drying to render the logs floatable, shows that it can also be used in making thinnings in closed stands.

32.2 : 07.7. **Logs in the woods: tools for handling and barking operations.** *Timb. Tr. J.* 155, 1940 (105).

Drawings are given of a 'Zapine' or tool for rolling, lifting and moving logs, and of a tool for barking, both of which are in use on the European Continent.

32.2 : 07.7. CORMAN, C., and BAKER, E. **Power saws in Washington.** *W. Cst. Lumberm.* 67 (10), 1940 (48a). [Weyerhaeuser Timber Co., Longview, Wash.]

Discussion of experience with power saws. Advantages include ease of operation, accuracy of felling and low stumps. These tools are practical but still require some improvements.

32.2 : 07.7 : 32.5 : 82. CHALLENGER, J. W. **Power saws: An analysis of four years' operation.** *Timberman* 41 (12), 1940 (53–8). [Bloedel Stewart & Welch Ltd., Port Alberni, B.C.]

The use of power saws, which have been adapted to the particular requirements of the woods conditions under consideration, has increased the average cut per man per day of fellers and buckers by one-third, reduced operating costs, reduced accident rate to fellers and buckers by 40 per cent., and increased the earning power and length of useful lives of the fellers.

### 32.5. *Logging Costs*

32.5 : 38. REYNOLDS, R. R. **Pulpwood and log production costs as affected by type of road.** *J. For.* 38, 1940 (925–31). [Southern Forest Exp. Sta.]

Data obtained from a study of production costs on six different sawlog operations and six different pulpwood operations in the Pine/

hardwood region of northern Louisiana, southern Arkansas, and eastern Texas, including time and cost figures for felling and bucking, loading, unloading and delay, and hauling per mile over woods, graded dirt, and gravel or hard-surface roads.

## 33. CONVERSION AND PRESERVATION OF WOOD

33 (75 : 76). SMITH, H. F. **Trends in the primary forest industries of the Lower South.** *Sth. Lumberm.* 161 (2033), 1940 (110–2). [Southern Forest Exp. Sta.]

### 33.15. Manufacture of Veneers and Laminated Wood. Gluing

33.15. GUNN, A. L. **A survey of the literature dealing with 'improved' wood.** *Aust. Timb. J.* 6, 1940 (143–51, 173–4). [Division of Forest Products, C.S.I.R.].

Most of the information presented was obtained from German technical journals. The timbers discussed are *Fagus* and *Betula* species. The manufacture and properties of the following materials are included in the survey: (1) Lignostone, a solid compressed non-impregnated wood; (2) ordinary laminated wood, usually bonded with Tego glue-film and ranging from 18 to 330 plies per inch; (3) Kunstharzschichtholz ('KHS'), a laminated wood made from thin plies pre-impregnated with synthetic resin; and (4) Lignofol, a laminated wood of *F. sylvatica* glued with Tego glue-film under high pressure and temperature.

33.15. **Radio enters the gluing field.** *Mon. News Lett. Div. For. Prod. Aust.* No. 105, 1940 (2–3).

Experiments carried on since 1938 have been successful in developing a method for using radio oscillations to generate the heat required in binding laminated stock with heat-reactive glues.

33.15. **Water-resistant glues.** *Tech. Note For. Prod. Lab., Wis.* No. *F*–4 [revised ed.], 1940. pp. 3.

A brief note on the general qualities and use of the main types of water-resistant glues.

33.15 : 33.0 : 12.2. COX, H. A. **Notes on Empire timbers.** *Emp. For. J.* 19, 1940 (292–4).

Timbers of the West African species *Scottellia coriacea* and *Sterculia rhinopetala* from Nigeria, *Ochrocarpus africanus* from the Gold Coast, and *Celtis soyauxii* from Nigeria and the Gold Coast were tested for the manufacture of technical plywood. All specimens showed defects that spoiled them for this purpose, although it is believed that commercial plywood of good grade could be made from timbers of the first and last named species if the peeling were done in the country of origin immediately after felling.

33.15 : 31.22 : 31.8. BROUSE, D. **Some causes of warping in plywood and veneered products.** *Wood Products* 45 (10), 1940 (23–9). [Forest Products Laboratory, Madison, Wis.]

Mainly a discussion of the specific causes of twisting, which is generally the result of variation in grain direction, and of cupping, which results from certain defects in construction and from improper handling.

33.15 : 38. GRAMELSPACHER, C. U. **Rubber-coated plywood for road surfaces.** *U.S. Patent* No. 2,199,700, May 7, 1940. Chem. Abs. 34 (6038). P.R.

Plywood blocks are formed of relatively thin layers of veneer bonded with an adhesive, with the layers horizontally disposed parallel to the road surface, and are enclosed with a vulcanized rubber covering on all surfaces.

### 33.17. Sawmilling

33.17 : 07.7. TELFORD, C. J. **A custom mill that goes to the logs.** *J. For.* 38, 1940 (938–40).

Description of a portable circular mill and the method of its operation. The mill weighs about 3,600 lb., rides on springs over a single truck axle, and has the speed and manoeuvreability of an ordinary truck-trailer unit. It has a 48-in. headsaw and handles logs up to 24 ft. long. It is powered by a petrol engine, uses about 4 gals. of petrol per thousand bd. ft. and averages 1,000 bd. ft. of relatively accurately cut material per hr.

33.17 : 52.4. SCHUMACHER, F. X., and JONES, W. C. **Empirical log rules and the allocation of sawing time to log size.** *J. For.* 38, 1940 (889–96). [Duke School of Forestry.]

A method of developing empirical log rules, pertinent to the production of particular sawmills, is discussed and illustrated. Its practical value is primarily in the utilization, as sampling units, of the log consumption and lumber

production of the working day, and thus the detailed tally of volume board measure of manufactured lumber, log by log, becomes unnecessary. By including the working time of the sawmill in the calculations this method may be extended to the problem of allocating sawing time to log size. *From authors' summary.*

## 33.3. *Chemical Treatment*

33.3. POTTER, G. J. C. **Cellulose and other chemical products from wood (excluding paper).** Forest Products Laboratories, Ottawa. 1939. pp. 19.

A concise explanation of the different chemical uses of wood, other than for paper manufacture. The products are classified into seven main categories, namely purified wood cellulose, crude wood cellulose, wood flour, degraded cellulose, waste sulphite liquor, wood-distillation products, and wood as fuel. The general trend is to use more and more wood pulp for purposes other than papermaking. This is due chiefly to the rapid expansion of the viscose rayon industry in Japan and the U.S.A. The paper includes 43 selected references.

33.3 : 31.28. STEARNS, J. L. **New wood treatment simplifies bending.** *Sth. Lumberm.* 161 (2030), 1940 (28).

Any wood that has been treated with urea can be bent and twisted readily after heating to a temperature of 175° F.—the urea and lignin combining to form a thermo-plastic. Suggested urea treatment is soaking in a saturated solution of one pound of urea to one pint of water, at room temperature for one week per inch of thickness of the lumber.

## 33.32. Pulp and Paper Manufacture

33.32 : 09.4 : 98.1 (73). **Pulpwood consumption and costs trends [in the United States] 1921-1939.** *Pulp Paper Mag. Can.* 41, 1940 (785–6). [*Extr.* from the Monthly Statistical Summary for August 1940 of the American Paper & Pulp Association.]

33.32 : 12.2. **Average yields of pulp from various species of wood.** *Tech. Note For. Prod. Lab., Wis.* No. 191, [revised ed.] 1939. pp. 3. P.R.

A table of average pulp yields is given for 17 softwood and 12 hardwood species.

33.32 : 12.2. BAHRFELDT, K., and JAPING, H. W. Onderzoek naar de geschiktheid van Nederlandsch-Oost-Indische houtsorten voor de fabricage van cellulose en papier. **[An investigation of the suitability of Dutch East Indian woods for pulp and paper manufacture.]** *Tectona* 33, 1940 (323–76). [Du.e.]

The ten coniferous timbers tested were *Agathis dammara* Rich., *Callitris calcarata* R.Br., *Cryptomeria japonica* D. Don, *Cunninghamia lanceolata* Hook., *Cupressus lusitanica* Mill. var. *benthami* Carz., *Pinus insularis* Endl., *P. merkusii* Jungh et de Vr., a *Pinus* species known in Japanese as Taiwan Akamatsu, *Podocarpus amara* Bl., and *P. imbricata* Bl. It was found that these timbers can be used without any difficulty for the manufacture of kraft paper and of paper bags that satisfy the official requirements. Cooking was by the sulphate process, the yield of kraft cellulose varying between 45 and 52 per cent. The ten species furnished cellulose of much the same quality, though the first five may be considered preferable owing to greater fibre length. Broadleaved timbers tested included *Acacia decurrens* Willd. var. *mollis* Lind., *Eucalyptus alba* Reinw., *E. globulus* Labill., *Guazuma ulmifolia* Lamk. var. *tomentosa* Schum., *Styrax benzoin* Dryand, *Anthocephalus cadamba* A. Rich., *Hibiscus similis* Bl., *Manglietia glauca* Bl., *Shorea eximia* Scheff., *Shorea* sp. (White Meranti), *Shorea* sp. (Red Meranti), and *Trema orientale* Bl. Of these twelve timbers the first five could be approved for the manufacture of bleached cellulose to serve as an admixture in paper production. These five timbers were treated both by the sulphite process (American method, the so-called 'quick cook', with 20 to 25 per cent. $SO_2$ as based on the air-dry weight of the wood, the cooking time being from 5 to 7 hours) and the soda method, and were worked up into white paper. From the sulphite process the yield of bleached cellulose was 45, 31, and 35 to 40 per cent. for *Acacia decurrens*, *Styrax benzoin*, and the remaining three timbers, respectively, whilst from the soda process 44 per cent. was yielded by *Acacia decurrens* and 40 per cent. by the other timbers, percentages being based on the weight of air-dry wood. With regard to the economic outlook for the establishment of a pulp and paper industry in the Netherlands Indies, it is thought that the first attempt should be directed towards the manufacture of kraft pulp. This would involve a relatively modest investment of capital and most of the consumption would be internal. Should the pulp industry develop,

Japan would probably be the best foreign customer. The only pulp-yielding timbers that are, or shortly will be, available in sufficient amounts, are *Pinus merkusii*, *Agathis* spp., and *Acacia decurrens*. Under the prevailing conditions the growth of these species is very fast, and short rotations are sufficient to produce large amounts of pulpwood together with the chief products yielded by these species, including saw and veneer timber, balsam, gum copal, and tanning bark.

33.32 : 12.2. Den, H. **Pulp manufacture from Manchurian 'Sirakanba' Birch. I. Analysis and cooking by the soda process.** *J. Soc. chem. Ind. Japan* 42, 1939 (356–7B). B.C.P.A. 1940, B (730). P.R.

33.32 : 12.2. Simoda, I., Kumura, Z., and Huziwara, T. **Preparation of cellulose pulp by the nitric acid process. X. *Fagus* and *Quercus glandulifera*.** *Cellulose Ind., Tokyo* 15, 1939 (78–81, 428–9). [Jap.g.] Chem. Abs. 34 (6066). P.R.

33.32 : 12.2 : 31 : 63. Bethel, J. S. **Loblolly Pine pulping qualities.** *Paper Ind.* 22, 1940 (358–9). [Pennsylvania State College.] L.S.

A study was made of fibre length and specific gravity of Loblolly Pine (*Pinus taeda*) wood as related to age and position in the tree. It was found that at any particular height in the tree, fibre length increased with age, the increase being rapid in the first few rings but grading off with increasing age until a constant length was approached. A similar relation existed between specific gravity and age, and in this case the effect of height in the tree was far more pronounced than for fibre length. Owing to these relations, a core representing the first 10–15 years' growth contains a high proportion of short fibres and has a much lower specific gravity than that of later years' growth. Pulpwood rotations should therefore be long enough to ensure that such cores should not make up any considerable portion of the final product. It is further suggested that pulping treatment would be greatly simplified by establishing grades for pulpwood based on the following criteria: (i) density of wood, expressed in terms of rings per inch and percentage of summerwood; (ii) age, ratio of short-fibred core to older wood; (iii) defects, e.g. knots, decay, and compression wood.

33.32 : 12.2. Benson, H. K., and Lucas, J. E. **The pulping of Douglas Fir with ammonium bisulphite.** *Paper Tr. J.* 111 (7), 1940 (32–4). [University of Washington, Seattle.] P.R.

The best pulp obtainable was at 350° F. with 1 per cent. free $SO_2$ and 9 hrs. cooking time. The more completely the pulp is digested the lower the strength. The use of Douglas Fir pulp for cellulose derivatives warrants further investigation. *From authors' summary.*

33.32 : 12.2. Hu, E. **Wood pulp. X. Results of cooking experiments with Lauan [*Shorea* and other dipterocarp] woods.** *Cellulose Ind., Tokyo* 15, 1939 (52–3). [G.] Chem. Abs. 34 (2591–2). P.R.

## 33.33. Manufacture of Textiles from Wood

33.33. Fenwick, A. R. **Notes on rayon staple fibre.** *For. Chron.* 16, 1940 (255–7).

## 33.34. Dyeing [and Bleaching] of Wood

33.34. Boynton, F. R. **How to match colours with stains mixed to suit different woods.** *Ind. Finishing* 16 (8), 1940 (30–3). Chem. Abs. 34 (5266). P.R.

33.34. Baymiller, J. W. (to A. G. Spalding & Bros. Inc.). **Bleaching wood surfaces.** *U.S. Patent* 2,203,589, June 4, 1940. Chem. Abs. 34 (6792). P.R.

Description of apparatus and of a process of treating wood surfaces with a solution containing $H_2O_2$ for a time sufficient to effect superficial bleaching but insufficient for substantial penetration or saturation, followed by subjection of the wood to an alkaline atmosphere, e.g. one containing $NH_3$, to increase the bleaching action, treating with hot water for a short time to avoid subsequent discoloration, drying, and treating the surfaces with ethylene glycol to prevent checking.

33.34. Allen, L. R. van. **Bleaching wood in log form.** *U.S. Patent* No. 2,205,770, June 25, 1940. Chem. Abs. 34 (7572). P.R.

A solvent is forced lengthwise through the log to remove natural soluble material, which is replaced by a bleaching agent. Apparatus is described.

## 33.35. Seasoning. Drying

33.35 : 07.7. **Emergency kilns: timber drying to meet the new conditions.** *Wood* 5, 1940 (293–5).

33.35 : 12.2. PECK, E. C. **A new approach to the formulation of hardwood dry kiln schedules.** *Sth. Lumberm.* 161 (2033), 1940 (136–7). [Forest Products Laboratory, Madison, Wis.]

From laboratory-scale experiments it appears practicable to base hardwood drying schedules on the character and magnitude of the stresses present in the timber rather than on its average moisture content. The preliminary stress schedule used was simpler than the conventional schedules and greatly reduced the time in the kiln.

33.35 : 12.2 : 33.36. **The steaming and seasoning of English Beech.** *Leafl. For. Prod. Res. Res. Lab.* No. 16, 1940. pp. 8.

Steam sterilizes the timber and may improve its colour, and should be applied in a chamber other than the drying kiln. Suggestions are made for the proper seasoning of English Beech.

33.35 : 24.21 : 12.2. **Seasoning by girdling.** *Malay. For.* 9, 1940 (187–8).

Three trees of Kapur (*Dryobalanops aromatica*) were girdled and poisoned with sodium arsenite in April, 1939, and by the middle of August they were dead. Borings penetrating to 3 in. below bark were sampled for moisture content before girdling and at intervals up to April, 1940. The moisture contents of portions of the trunks up to 50 ft. above ground are tabulated in full. The figures show that moisture was fairly evenly distributed throughout the trunks, except in one tree where there was a slight reduction of moisture content with increasing height in the trunk. The moisture contents 1 year after girdling are rather variable and show an average reduction of about 7 per cent., but this may well be confined to the sapwood. It is doubtful whether the butt logs have yet reached a moisture content at which they would be floatable, i.e. about 45 per cent. moisture. No sign of borer attack was observed at the end of the year.

33.35 : 31.8. **The detection and relief of casehardening.** *Tech. Note For. Prod. Lab., Wis.* No. 213, [revised ed.] 1940. pp. 4. P.R.

Description of tests to indicate moisture content and internal stresses in lumber following kiln drying, and of treatment for the relief of casehardening.

33.35 : 31.8. GREENHILL, W. L. **Collapse and its removal.** *Aust. Timb. J.* 6, 1940 (160–1, 171). [Division of Forest Products, C.S.I.R.].

Includes a list of Australian timbers prone to severe collapse.

33.35 : 33.15. TIEMANN, H. D. **Application of high frequency electrical fields to drying and gluing of wood.** *Sth. Lumberm.* 161 (2029), 1940 (39–40).

While the practical use of high-frequency electrical fields for the drying of timber is far from being established either technically or from an economic point of view, the method appears practicable for the polymerization of synthetic resin glues in the manufacture of laminated articles, such as plywood. The heating of the glue planes is not only feasible in any thickness of materials, but the wet glue can be made hotter than the surrounding wood, thus doing away with all danger of injury to the latter. [Cf. *For. Abs.* 2 (227).]

33.35 : 33.31 : 12.2. NEWINS, H. S. **Chemical seasoning of Tidewater Red Cypress.** *Sth. Lumberm.* 161 (2033), 1940 (127–9). [University of Florida.]

Report on recent experiments, by the Burton-Schwartz Cypress Company of Florida in co-operation with the School of Forestry of the University of Florida, on the chemical air seasoning of *Taxodium distichum.* The spreading of urea crystals on the flat-grain surfaces and across the horizontal ends of the timber as stocks were strip piled, using 40 pounds of urea per thousand bd. ft. of timber, proved sufficient protection against surface checking during air seasoning. The chemical treatment did not impair any of the qualities of the timber, but even decreased its inflammability. The application of the chemical in crystals was practicable owing to the very high moisture content (160 to 180 per cent. as based on the oven-dry weight) of Tidewater Red Cypress 'green from the saw', and to the homogenous texture of the timber; the crystals diffused into the wood within a week's time. The chemical and its application cost only $1·85 per thousand bd. ft., and, in the tests described, the treatment effected a net saving of $41 to $90 per thousand bd. ft. by the elimination of surface checking.

## 33.36. Preservation of Wood. Impregnation

33.36. **Methods of applying wood preservatives.** Forest Products Laboratory,

Madison, Wis. No. *R*154, [revised ed.] 1940. pp. 20. P.R.

33.36. PRÜFER, H., and N. V. GIPS HOUTBEREIDING. **Impregnation of wood with saponified resin or artificial resin.** *Dutch Patent* No. 47,957, 15th Mar., 1940. Chem. Abs. 34 (7572). P.R.

Wood is impregnated at 80–110° with solutions of saponified resins, to which oils, fats, waxes or paraffin may be added. The heat in the interior of the wood is then utilized for drying the wood in the same apparatus by lowering the pressure and heating with superheated steam. The apparatus can be heated by direct as well as by indirect steam. The treatment is completed in a few hours. Pressure during impregnation is from 3 to 10 atms.

33.36. KUFFERATH, A. **German raw materials: improved wood. [Water-, mould-, and flame-proofing, and improving resistance to tropical conditions.]** *Zellwolle, Kunstseide, Seide* 45, 1940 (71–2). Chem. Abs. 34 (6037). P.R.

33.36 : 07.7. FRANK, M. B. **Apparatus for automatically spraying lumber with preservative fluids.** *U.S. Patent* No. 2,206,179, 2nd July, 1940. pp. 7. P.R.

Details of construction and operation are given.

33.36 : 07.7. SCHAD, H. **Device for impregnating wood.** *British Patent* No. 522,567, 9th Dec., 1938. B.C.P.A. 1940, B (739). P.R.

A nozzle is shaped with a thread like that of a wood screw and after insertion in the timber is supplied with impregnating fluid under pressure. The screwing into the wood may be affected by a turbine operated by pressure liquid.

33.36 : 31.43 : 13.2. FEYTAUD, J. Un redoutable ennemi des charpentes de pin et de sapin: le longicorne *Hylotrupes bajulus* L. **[A serious pest of Pine and Fir structural timbers: the longicorn *Hylotrupes bajulus* L.]** *Rev. Zool. agric.* 38 (9/10), 1939 (81–8). [F.] R.A.E. A28 (567).

None of the substances, such as creosote, used to impregnate structural timbers to repel ovipositing females of *Hylotrupes bajulus* affords lasting protection; hence the treatment should be periodically repeated. It is advisable to inspect timber in buildings every 4–5 years. Where possible, control should consist in scraping off all damaged wood, and sound timbers should be whitewashed. The author has eradicated moderate infestations in floors by introducing volatile liquids such as carbon bisulphide, carbon tetrachloride or benzene into the wood through holes drilled at intervals and stopped with corks, or by brushing infested wood with a 1 : 1 or 2 : 1 mixture of carbon tetrachloride and paradichlorobenzene. He has also successfully dealt with severe infestations by injecting chloropicrin into beams and other structural timbers, and by spreading it on the floors of rooms, attics or lofts and closing them for 24–48 hrs.

33.36 : 31.43 : 13.2. TESSIER, G.-A. Nouvelle diète pour le dermeste du lard. **[A new diet for *Dermestes lardarius*.]** *La Forêt Québecoise* 3 (1), 1941 (29–34). [F.]

Larvae of this insect are reported to have bored into the wooden structure of a storehouse and into spindle timber stored in it. The place had previously been used for the storing of dried herring. Experimental data on control methods are presented.

33.36 : 31.43 : 13.2. TUCKER, R. W. E. **The termites of Barbados.** *Agric. J. Barbados* 8, 1939 (132–44). R.A.E. A29 (5–7).

Notes are given on the termite fauna of Barbados, and a number of control measures are described against termites already infesting timber in buildings. Observations indicate that British Guiana Greenheart (*Nectandra rodioei*), Wallaba (*Eperua falcata*), and Mahogany are the most resistant timbers, although they are not immune. Increasing use is being made of Greenheart and other hardwood timber for building. An experiment with 5 commercial preparations showed that 2 afforded complete protection from termites, and a further test in the absence of termites proved that they were good preservatives. These commercial preparations are recommended. It is also suggested that wood for internal use that is to be painted or polished can be proofed with a 5 per cent. aqueous solution of zinc chloride, and that creosote is of value on outdoor work that is not to be painted. For effective treatment, an even coat of preservative must be applied to all surfaces, including cut ends and edges. The use of metal courses in the foundations of new buildings does not yet appear to be necessary in Barbados.

33.36 : 31.43 : 31.22. BARR, G., THOROGOOD, A. L., and REST, E. D. VAN. **The fumigation**

**of wood by hydrogen cyanide.** *J. Soc. chem. Ind.* 59, 1940 (219–26). [Forest Products Research Laboratory, Princes Risborough, Bucks.] P.R.

A study of the amounts of HCN gas sorbed by wood, the amounts removed by aeration, and the rate of emission after a fair period of aeration, showed that: (1) The degree of sorption was very high, so that the attainment of toxic concentrations within solid pieces of wood must be very slow. (2) The rate of removal was also slow, but even after 50 hrs.' aeration the quantities emitted were considered high enough to be dangerous to man, especially in a confined space. (3) Amounts up to 6 mg. HCN per g. of wood appear to be fixed in a form not removable by aeration.

It is concluded that approximate values for the properties concerned in fumigation and aeration processes are: conductivity = 1·0 ml./cm.$^2$/cm./atm. partial pressure/hour; quantity sorbed = 400 mg. per g. wood per atm. partial pressure; diffusivity coefficient = 0·003 c.g.s. unit. The low diffusivity coefficient as compared with that assumed in previous work [*J. Soc. chem. Ind.* 57, 1938 (339)] is entirely due to the high degree of sorption now found. The estimated fumigation times in the previous paper are therefore probably much too low, and the success achieved with such fumigation must be due to other means of entry of the gas, such as cracks or old beetle exit-holes.

33.36 : 31.45. Roux, M. A. Essais d'inflammabilité et de combustibilité de matériaux (méthode du calorimètre appliquée à l'essai des bois ignifugés). [**Tests on the inflammability and combustibility of materials (calorimeter method applied to the testing of fire-proofed woods).**] *Recherches et Inventions* 19, 1939 (64–73). [F.] L.S.

Fire-proofing decreased the amount of heat that was liberated in the combustion of small specimens of eight different timbers (Oak, Beech, Ash, Alder, Poplar, Walnut, Magnolia, and Silver Fir). It is suggested that fire-proofing modifies the composition of distillation gases so as to decrease their combustibility.

33.36 : 31.46. Baldeschwieler, E. L., and Wiezevich, P. J. (now Gaylor, P. J.) (to Standard Oil Development Co.). **Waterproofing building materials such as brick, stone, wood, &c.** *U.S.Patent* No. 2,199,193, 30th Apr., 1940. Chem. Abs. 34 (6038–9). P.R.

Waterproofing is effected by use of a composition formed of paraffin wax together with 10–20 per cent. of a drying petroleum oil obtained by cracking a petroleum oil at temperatures of about 700–1200° F., about 0·1 per cent. of a paint drier such as Japan drier, and about 65 per cent. of heavy naptha.

33.36 : 31.46. **Aluminium coatings for moisture proofing wood.** *Tech. Note For. Prod. Lab., Wis.* No. 228, [revised ed.] 1940. pp. 4. P.R.

33.36 : 33.31. Harvey, J. E. **Wood-preservative oil.** *U.S. Patent* No. 2,195,413, 2nd Apr., 1940. Chem. Abs. 34 (5269–70). P.R.

Use is made of a mixture of 10–90 per cent. of synthetic creosote produced by hydrogenation of pitch or tar, boiling less than 10 per cent. at 210° and not less than 50 per cent. at 355°, with 90–10 per cent. of coal-tar fractions boiling substantially completely above 200°. The mixture boils less than 10 per cent. at 210° and not less than 40 per cent. at 355° and has toxic properties greater than those of a mixture of natural coal-tar products of similar physical properties.

33.36 : 33.31. Gordon, A. **Preserving wood.** *U.S. Patent* No. 2,194,827, 26th Mar., 1940. Chem. Abs. 34 (5268–9). P.R.

An impregnating composition suitable for treating fence posts, etc., is formed of $CuCO_3$–$Cu(OH)_2$ 10 per cent., $ZnCO_3$–$Zn(OH)_2$ 10 per cent., $CuNH_4PO_4$ 30 per cent., $ZnNH_4PO_4$ 30 per cent., $ZnB_4O_7$ 10 per cent., and $CuB_4O_7$ 10 per cent., and is dissolved in aqueous $NH_3$ solution.

33.36 : 33.31. Häger, B. O. (to Bolidens Gruvaktiebolag). **Wood impregnation.** *U.S. Patent* No. 2,202,579, 28th May, 1940. Chem. Abs. 34 (6792). P.R.

A preservative solution, containing arsenic acid or its alkali metal salts or water-soluble salts of Zn or Cu together with a chromate fixing agent, is used with not more than about 5 per cent. of the solids present of a 'regulating agent', which may be a chlorate, persulphate, or permanganate and serves to prevent too quick reduction. $AgNO_3$ or an Os salt may be used as a catalyst.

33.36 : 33.31. Jenet, J. **Improved process for the manufacture of creosote.** *British Patent* No. 523,609, 1940. Fuel Res. Summ. 1940 (689). P.R.

A creosote for impregnating wood by simple steeping comprises about 75 per cent. by volume of heavy coal-tar creosote, together with a proportion of light oil distillate of coal tar containing phenol and naphthalene, crude benzol, and dehydrated coal tar. The product is liquid at normal temperature.

33.36 : 33.51 : 12.2. **Service tests on sleepers.** *Malay. For.* 9, 1940 (186–7).

A report on a 12½-year service test of Kempas (*Koompassia malaccensis*) and Keruing (*Dipterocarpus baudii* and *D. crinitus?*) sleepers, pressure-treated with pure creosote or a 75/25 mixture of creosote and Diesel fuel oil. Results are not conclusive, but are very encouraging particularly in the case of Keruing.

33.36 : 33.52. Johnson, R. A. **Preservation of wooden poles.** *Elect. Engr. Merch.* 17, 1940 (17–8). R.A.M. 19 (689).

The 'sand-creosote collar' method of ground-line preservation is giving excellent results in New South Wales, where impregnated poles of the Maritime Services Board are still sound after five years' service. A two-piece galvanized-iron cylinder fastened with slides, allowing a cavity of about 1 in. all round the pole and extending 12 in. below ground and 6 in. above it, is filled with creosote-saturated sawdust, re-treatment with ½ gal. of creosote being necessary every 2 years. After back-filling with impregnated sawdust, the top is finished off with a tar compound, through which are inserted filler caps for re-treatment.

33.36 : 33.52. Wirka, R. M. **Tire-tube method of fence-post treatment.** Forest Products Laboratory, Madison, Wis. No. *R*1158, 1940. pp. 17. P.R.

A popular guide to the use of this method, which is an adaptation of the old Boucherie process. It consists in treating green, round posts by forcing preservative solution endwise through the sapwood portion of the post. In making the treatment, the bark is peeled for a distance of 4 to 6 in. from the large end of the post, to provide a smooth, clean surface. A section of old inner tube about 2 or 2½ ft. long is slipped over the peeled surface and bound in place. The post is then laid on a rack with the large end about 1½ ft or more higher than the small end. The loose end of the tube section is fastened to a frame so that the preservative cannot spill out but will be kept in close contact with the end of the post, and a measured amount of preservative solution is poured in. When all the preservative has flowed from the tube into the wood, the tube is removed and the post is taken from the rack. Zinc chloride is recommended as the most suitable preservative. The drip should be saved and used in the preparation of additional solution. The results indicate that good treatment can probably be obtained in most species that have a substantial thickness of sapwood. The average life of posts thus treated is probably shorter than that obtained through pressure or hot-and-cold bath treatment with creosote, but the tire-tube method is much cheaper.

33.36 : 33.52. Eckbo, N. B. **Chemical treatment of green wood by the gravity method.** Forest Products Institute, Pretoria, South Africa. pp. 6 [typescript].

Creosote with a 20-per-cent. admixture of fuel oil penetrated, in 15 hours, a six-foot length of a standing *Eucalyptus paniculata* tree of which the top portion had been cut off. A section of an old motor-car tube had been securely wired around the top of the pole and the preservative poured into this receptacle. The amount of creosote absorbed was estimated at 1 lb. per cu. ft. of wood.

## 33.37. Distillation. Manufacture of Tar

33.37. Sharkov, V. I. **Dry distillation of wood, peat, &c.** *Russian Patent* No. 53,501, 31st July, 1938. Chem. Abs. 34 (5278). P.R.

The material is carbonized under pressure at 300–500° and products of primary decomposition are continuously drawn off by means of a heat-stable organic solvent that remains liquid at the pressure in the reaction vessel.

33.37 : 07.7. Rudbäck, E. Framställning av tjära, tjärolja och terpentin i mindre ugnar. [**Manufacture of wood tar, tar oil, and turpentine in small retorts.**] *Skogsägaren* 16, 1940 (197–9). [Sw.]

A description is given of a simply constructed type of retort provided with a condenser for recovering tar oil and turpentine from the gaseous products of distillation. The raw material used consists of chopped Pine stumps, preferably 2–5 years old. For efficient operation and to reduce building costs it is advisable to build two retorts together, as a single condenser will serve both. The cost of two retorts and the building in which they are

housed is estimated at about 14,000 Kr. Operating costs per retort per day are estimated as:—

| | |
|---|---|
| 6 cu. m., stacked measure, of tar wood | 60 Kr. |
| 2 cu. m., stacked measure, of furnace wood | 18 „ |
| Labour | 20 „ |
| Total | 98 „ |

The yields per burn (occupying about 24 hours in all) are approximately:—

| | |
|---|---|
| 200 kg. tar, valued at | 80 Kr. |
| 40 kg. tar oil, valued at | 16 „ |
| 100 kg. turpentine, valued at | 45 „ |
| 30 hl. charcoal, valued at | 45 „ |
| Total | 186 „ |

Profitable operation depends on the existence of supplies of Pine stumps within easy reach of the plant. Under present conditions the products find a ready market, and the establishment of such retorts should not prove too great a financial risk.

33.37 : 07.7. Saltsman, D. J. (one-third each to W. B. Crane and G. W. Laubenthal). **Apparatus for distilling wood.** *U.S. Patent* No. 2,196,343, 9th Apr., 1940. Chem. Abs. 34 (5278). P.R.

33.37 : 34.26. Scruggs, J. A. **Rosin, Pine oil and turpentine.** *U.S.Patent* No. 2,202,028, 28th May, 1940. Chem. Abs. 34 (6802). P.R.

Description of apparatus and process for producing turpentine, Pine oil and a purified and decolorized rosin from particles of coniferous wood by placing a charge of the wood particles in a vessel, sealing the vessel, circulating steam through the charge to remove the turpentine and Pine oil, removing the residual moisture, then recycling through the charge, without condensation, a superheated gasified hydrocarbon material of the character of gasoline, which will not crack at the temperatures used and which increases the temperature of the charge to about 520° F., then withdrawing the hydrocarbon gases from the vessel by applying a vacuum, and last drawing off the purified and decolorized rosin by vacuum distillation induced by the stored heat.

## 33.38. Charcoal Manufacture. Charcoal. Use of Wood in Power-Gas Generators. Producer Gas

33.38. **Australia's national fuel: Charcoal gas.** *Aust. Timb. J.* 6, 1940 (195–6).

A paper by Messrs. National Fuel Engineers, Sydney, manufacturers of National Gas Producers. The following points are emphasized: vast charcoal reserves are available in Australia; National Gas Producers, which are built on the cross-draught principle, satisfy modern requirements for mobile units; and the manufacture of compressed briquettes, which is being investigated in Australia, will, when developed, help to solve the problem of fuel distribution.

33.38. **Charcoal burning: Pit methods.** *Aust. Timb. J.* 6, 1940 (197–9).

Two pit methods for burning charcoal are described by the New South Wales and Queensland Forest Services.

33.38. Compagnie Française de Raffinage. **Process for improving the useful qualities of wood charcoal and the products thereof.** *British Patent Appl.* No. 7527, 1940. Fuel Res. Summ. 1940 (684). P.R.

Wood charcoal is impregnated with petroleum pitch by immersing it, preferably after drying in a drying oven, in pitch heated to a temperature above 100° C.

33.38. Överskottsvärme från träkolsugnar ger värme till växthus. **[Surplus heat from charcoal kilns as a source of heat for greenhouses.]** *Skogsägaren* 16, 1940 (142–3). [Sw.]

It is suggested that the use of surplus heat from charcoal kilns to warm greenhouses might lead to a profitable combination of charcoal burning and vegetable growing, and help to relieve the winter shortage of greenstuffs in Sweden.

33.38 (485). Svenska Gengasaktiebolaget. **[The Swedish Producer Gas Company.]** *Skogsägaren* 16, 1940 (145). [Sw.]

The Swedish Producer Gas Company [*For. Abs.* 2 (233)] has already ordered 7,000 wood-gas generators, of which 3,000 are for tractors and the rest for lorries. It is intended that both generators and charcoal or wood fuel shall be distributed and sold through existing trade channels.

33.38 : 07.7. Bergström, H. Kolning i milugnar och s. k. hemkolning. **[Charcoal-burning in kilns and 'home charcoal-burning' (i.e. by local small-scale methods).]** *Jernkontorets Annaler* 124, 1940 (265–73). [Sw.] L.S.

Details are given of the construction and operation of simple brick-built charcoal kilns

as used in Sweden. Such kilns are economical only where there is a constant supply of wood and transport presents no obstacles, e.g. where regular supplies are available from thinnings, or near sawmills, where waste wood is available in quantity. Many kilns have been built to meet the current demand for producer charcoal, but this market may be a temporary one, especially as the use of wood as a producer fuel is likely to increase. In choosing between pile- and kiln-burning the following points should be considered:—(i) Properly calculated, yields are about the same. Kiln-burnt charcoal usually has a lower dry weight per unit volume. (ii) Establishment costs are negligible in pile-burning, but kilns involve both establishment and maintenance costs. (iii) Any type of wood that can be charred in a kiln of this type can also be dealt with in beehive piles. (iv) Pile-burning is easy to learn and is no longer considered an art. (v) Under similar conditions, pile-burning takes at most as much time as kiln-burning. Kilns are more 'sensitive' to moist wood. (vi) In the woods, piles can be so situated that wood transport costs are reduced to a minimum. Portable kilns have given no better results than piles and are relatively dear.

Brief reference is also made to small-scale methods of charcoal-burning, e.g. in pits, in small iron kilns and in smoke-stack piles.

33.38 : 07.7. DONALD, G. H. **Further notes on the manufacture of charcoal in portable kilns.** Forest Products Research Laboratory, Princes Risborough, Bucks. Jan., 1941. pp. 10.

A condensed account of up-to-date knowledge on the subject, including the experience gained under full-scale commercial conditions since the outbreak of war. Preliminary experience has already been reported in *For. Prod. Res. Rec., Lond.* No. 29. [Cf. *For. Abs.* 1 (183).]

33.38 : 07.7. ROBERTSON, E. D. **Charcoal kilns in the Matang Mangrove forests.** *Malay. For.* 9, 1940 (178–83).

There are now nearly 300 charcoal kilns operating in the Matang Mangrove reserves in Perak, and further expansion of the industry seems likely. The rapid rise of charcoal burning is attributed partly to the efficiency of the Siamese type of kiln, introduced in 1930 by Siamese immigrants. A detailed, illustrated account is given of the construction and operation of these kilns, which are brick-built domes about 21 ft. in diameter and 12 ft. high. Well-made kilns last nearly 10 years without needing major repairs. They are usually worked in batteries of 6–14 units, and this reduces labour and supervision costs. The wood used consists of large round billets of Mangrove, about 5 ft. long and of varying girth, those with a girth of 16–20 in. being said to make the best charcoal. A complete burn generally takes about 32 days. The charcoal is of good quality and the percentage of brands low. About 450–550 pikuls (16·8 pikuls=1 ton) are needed to charge a kiln, the yield of charcoal being 140–160 pikuls, and about 35 pikuls of firewood are required to fire each charge. A single Siamese kiln can be constructed for \$400–700 (\$8·57 = £1), the cost varying mainly with the type of foundation required. The cost of charcoal production at kiln site, allowing for royalty, depreciation charges, and 5 per cent. interest on capital required to build the kilns, is 80–85 cents per pikul, and the price ex kiln is 95 cents to \$1 per pikul. One experienced charcoal burner supervises each battery and a squad of 12 coolies at an average wage of \$1 a day can perform all the work for a battery of 15 kilns. The labour is almost entirely Chinese.

33.38 : 07.7. DUNKER, L. H. A. **Improvements in the manufacture of wood charcoal and to plants or kilns in such manufacture.** *British Patent* No. 526,135, 1940. Fuel Res. Summ. 1940 (845). P.R.

Includes means for admitting air beneath the charge, for exhausting combustion products from above the charge, and for supplying air to the top layer of charcoal that is first formed in the kiln.

33.38 : 07.7. WHITFIELD, C. **Improvements in or relating to charcoal kilns.** *British Patent* No. 526,416. 1940. Fuel Res. Summ. 1940 (845). P.R.

The specification of a type of kiln in which a restricted control of the air supply is effected by providing separate air chambers below the combustion surface of the grate.

33.38 : 07.7. PETTERSSON, F. M. **Method and means for manufacturing briquettes, more particularly charcoal briquettes.** *British Patent* No. 526,491, 1940. Fuel Res. Summ. 1940 (841–2). P.R.

Apparatus comprising a mixer in which powdered charcoal or the like is mixed with a binder, a press for forming the briquettes, and a drying kiln in which the briquettes are heated

and the gases from the binder expelled and returned directly or indirectly to the mixer, characterized by the provision of a heating vessel from which fresh gaseous binder is passed to the mixer to condense on the powdered carbonaceous material.

33.38 : 33.0 : 12.2 : 22.22. Gråalen, lämpligt bilbränsle. **[Grey Alder, a suitable motor fuel.]** *Skogsägaren* 16, 1940 (211). [Sw.]

Apart from its utility as a soil improver and nurse tree, Grey Alder has been regarded as little better than a weed species. It is, however, usually straight-grown and easily converted into charcoal, and charcoal containing a high proportion of Grey Alder has in no case given results inferior to those obtained with the usual mixed-hardwood product. It is suggested that existing stands of the species might be grown for charcoal in coppice with a rotation of 10–15 years, at which age the stems should be 5–6 in. in diameter and yield 200–400 cu. m. stacked measure per ha.

33.38 : 33.18. BRELIN, P. Upphuggning och behandling av gengasved. **[Cutting and treatment of producer wood.]** *Skogen* 27, 1940 (287–9). [Sw.]

A partial report on a study just completed by the Industrial Commission. Three main factors affect the value of wood as producer fuel: species, method of conversion, and moisture content.

Beech is a first-class fuel but occurs only in southern Sweden; Birch is good and is found all over the country; Aspen and Alder are also good. Other hardwoods produce good fuel but are too sparingly distributed to become of much importance. Oak appears to have a tendency to form soot. Coniferous wood is best used as an admixture to hardwoods, the normal proportion of the former being about 25 per cent., though up to 50 per cent. can be used. Thick bark and decay in any species result in loss of efficiency, and in Pine and Alder the thicker bark tends to form light flakes which are swept into the gas stream.

Three types of converted wood are in use: (1) Cleft billets, which should be 8 cm. long with an end area of about 25 sq. cm. for generators with air intake from the sides (Imbert and similar types), and 6 cm. long with an end area of 15–20 sq. cm. for generators with a central air vent. The billets must be completely separated in cleaving, otherwise they tend to jam in the generator. (2) Round billets, which may be rather longer, since they have not the same tendency to jam. Suitable sizes are 8–9 cm. long and 2·5–7·5 cm. in diameter for the first, and about 6 cm. long and 2·5–5 cm. in diameter for the second type of generator. (3) Chopped roundwood with more or less oblique ends, best produced in chopping machines. This type has not yet received the attention that it deserves, though it is cheap to produce. The bolts chop most cleanly when about half dry. Drying may be completed by storage in netting sacks or by spreading the billets in a layer 2–3 dm. high on the ground and turning once or more every day. In warm, sunny weather only a few days are required for drying by this method. Sandy ground should be avoided owing to the risk of contamination. A suitable size of billet for the Imbert type of generator is 7 cm. long (measured along one side, not diagonally) and not more than 9 cm. in diameter.

Most generators require wood of between 15 and 25 per cent. moisture content. The use of moist wood results in a loss of efficiency. Excessively dry wood also appears undesirable, as a certain amount of condensation water aids in the cleaning of the gas.

33.38 : 33.18. RIBERS, U. Vedgasen och gasveden. **[Producer gas from wood and producer fuelwood.]** *Skogsägaren* 16, 1940 (202–4). [Sw.]

The prices and reliability of wood- and charcoal-gas generators, and the distances covered per unit quantity of fuel, are now about the same, but wood is the cheaper fuel and for every unit of wood used direct, 2½ times as much wood must be carbonized to produce the equivalent amount of charcoal. As the 10,000 charcoal-gas vehicles in use already consume half as much charcoal as the iron industry, it is to be feared that the latter might suffer from too great an extension in the use of charcoal for producer gas.

A comparison is made of the costs of converting several types of wood to producer wood. The cost per hl. is estimated at 2·04 Kr. for small domestic firewood, 1·89 Kr. for first-quality Birch fuelwood, and 0·93 Kr. for wood from cleanings of hardwood thickets. In the last case it is assumed that a chopping machine is used, and as the wood must then be chopped in a moist state [cf. preceding abstract], the undetermined cost of drying will raise the cost quoted above. The type of conversion

to employ will depend on the age, area, and composition of the stands from which the wood is obtained, thus with hardwood thickets the chopping machine will almost certainly prove the most economical method.

33.38 : 33.18 : 07.7. BRELIN, P. Maskinell tillverkning av gengasved. II. **[Mechanical conversion of producer fuelwood.]** *Skogen* 27, 1940 (335–6). [Sw.]

Some 25 different machines for converting producer wood are now on the Swedish market, but not all of them are satisfactory. They are of the following types:—(i) combined cross-cutting, cleaving and chopping machines, (ii) combined cross-cutting and cleaving machines, (iii) cross-cutters, (iv) cleavers, and (v) choppers. The present article reports on 3 types that have undergone official tests:—(i) The Ari chopping machine. This is designed to chop wood not exceeding 10 cm. in diameter, and has the chopping iron set transversely in the middle of the periphery of an excentric wheel. In contrast to other machines of the chopper type it cuts the wood with practically straight ends into lengths of 7–8 cm. The wood is fed along a trough about 1 m. long and the finished product is thrown out on either side of the machine. A 5-h.p. electric motor is used for power. Tests showed a normal capacity of 25 hl. of producer wood per hr. (ii) The Ari cross-cutting and cleaving machine has a cross-cut saw moveable vertically by means of a handle and balanced by a weight on the opposite side of the machine. The sawn billets, which may be cut to various lengths by adjusting the saw, fall into a metal chute that carries them to the cleaver, where they are split by a wedge-shaped cutter mounted on a lever arm. A 5-h.p. motor is used, and two men are needed to operate the machine. The tests showed a normal capacity of about 8 hl. of producer wood per hr. The machine worked well and turned out a product equal in quality to hand-cleft wood; its capacity, however, is decidedly low. (iii) The Allved cross-cutter and cleaver first cuts 1-m. wood into half-metre lengths, cleaves the latter, and finally cross-cuts the clefts into short lengths. There are two cleavers mounted on the sides of the belt wheel and passing through openings in a 'chopping block'. A 5-h.p. motor is also used for this machine. The normal capacity under test was 11 hl. of producer wood per hr. Both the Ari and Allved combined cross-cutting and cleaving machines can also be used to convert small domestic firewood into producer wood, and tests with the latter machine using this material gave a capacity of 3 cu. m. per hr. The Allved machine does not reduce the wood to a precise and uniform size; hence the product is best suited to Imbert and similar types of generator.

33.38 : 98.1 (485). Gengasens bränslebehov vid årsskiftet ½ milj. hl i veckan. **[Consumption of producer fuel at the end of the year ½ million hl. per week.]** *Skogen* 27, 1940 (354). [Sw.]

At the beginning of May 1940 there were not more than about 1,500 producer-gas vehicles in Sweden, and practically all of these were run on charcoal. By October the total number had risen to 11,700, of which 8,850 were using charcoal and 2,850 wood. It is estimated with some certainty that roughly 11,900 charcoal-gas and 5,100 wood-gas vehicles, making a total of 17,000, will be on the road by November. The fuel consumption of such vehicles for September, October, and November, is calculated at about 140, 210, and 310 thousand hl. per week, and the proportion of charcoal to the total fuel consumption at 79, 74, and 68 per cent., respectively. The fuel consumption by the end of the year should be in the neighbourhood of half a million hl. per week, and the probable 'saturation point' at about 40 million hl. per annum. If it is assumed that 20 million hl. of this will be used as charcoal, the raw charcoal required will be about 2·5 million cu. m., or more than double the average annual charcoal consumption of the iron industry. To cover the probable figure for producer charcoal and wood some 7 million cu. m. of fuelwood will be required annually, which is practically the same as the normal consumption of fuelwood for heating and industrial purposes, disregarding fuelwood cut and used on the estate, which is estimated to total about 10 million cu. m. yearly. These figures emphasize the probability of some shortage of fuelwood and the desirability of securing a preponderance of wood-gas generators in current production.

## 33.39. Manufacture of Sugar, Oils, Alcohol, and Vinegar from Wood

33.39. BROWNLIE, D. **Wood as a chemical raw product: Latest developments in**

**sugar and alcohol production.** *Chem. Ind.* 59, 1940 (671–5). L.S.

A brief review is presented of methods for recovering sugar and alcohol from wood, including the Simonson and other early processes, the Bergius and Scholler processes, processes using waste pulp liquors, and the process recently developed by the Masonite Corporation [*For. Abs.* 2 (226)]. The last-named has a plant capable of producing 2,000 lb. of sugar and sugar products per 24 hrs.

33.39 : 91. ENSTRÖM, A. F. **The forest as a source of raw materials in peace and in war.** *Iva* 1940 (2), (48–57). Chem. Abs. 34 (6039). P.R.

## 33.5. *Roughly Converted Wood*

### 33.51. Pitprops and Sleepers

33.51 : 32.2 : 07.7. **Peeling pitprops: the tools and methods employed.** *Timb. Tr. J.* 156, 1941 (5).

A sharpened garden spade can be used. An alternative tool is described and illustrated. Suggestions in regard to peeling: (*a*) All species peel easily during growth period; (*b*) branches of felled trees should be cut flush with wood surface by axe before using peeling spade; (*c*) payment for peeling is best combined with that for felling and lopping on a piecework basis; (*d*) cost of subsequent handling of wood is reduced by peeling at time of felling.

33.51 : 32.5. **The cost of felling and peeling pitprops.** *Quart. J. For.* 35, 1941 (19–22).

The costs presented are from an estate in the north of England; considerable profits were realized by preparing the pitprops (peeled and unpeeled) on the estate. Profits were higher in the case of the unpeeled props.

## 33.7. *Firewood*

33.7 : 32. HEDEMANN-GADE, E. Brännved—några råd angående ett aktuellt sortiment. **[Fuelwood—some advice on an assortment of current importance.]** *Skogen* 27, 1940 (331–3). [Sw.]

The yield of fuelwood from older stands in a well managed forest seldom exeeds 10 cu. m. stacked measure per ha., as the bulk of the timber is more valuable for other purposes. Hence it is best to concentrate fuelwood fellings in stands 25–45 years old in central Sweden, about 5 years younger in the southern and about 10–15 years older in the northern parts of the country. Under present conditions it would seem to be good practice to convert all thinnings from such stands into fuelwood. Suggestions are made as to the best practice to be followed in logging, cleaving, hauling and stacking.

33.7 : 07.7. Nyheter i vedeldningspannor. **[New features in wood-fired boilers.]** *Skogsägaren* 16, 1940 (205–7). [Sw.]

An illustrated account of three improved types of central-heating boilers produced by Swedish firms.

## 33.8. *Other Manufactured Products*

33.8. STEARNS, J. L. **Wood in boats: A preliminary survey of the U.S. boat building industry and its importance to the lumberman.** *Sth. Lumberm.* 161 (2033), 1940 (138–40).

# 34. MINOR FOREST PRODUCTS AND THEIR UTILIZATION

## 34.2. *Vegetable Products*

### 34.23. Wood Ash

34.23 : 12.2 : 11.47. TAYLOR, A. J. **Waste materials of manurial value (wood ashes).** *S. Afr. Sug. J.* 24, 1940 (77). [College of Agriculture, Cedara, Natal.] L.S.

Mature Wattle wood has an ash content of rather less than 1 per cent., but young wood contains higher amounts. Ash from young wood is richer in potash and phosphate but poorer in lime than that from older wood. The approximate composition of the ash is:—potash 15–25 per cent., phosphoric oxide 1–2·5 per cent., lime (as oxide) 20–30 per cent. In terms of ordinary fertilizers, 100 lb. of clean Wattle ash roughly equals 25–40 lb. of muriate of potash, 30–50 lb. of agricultural lime and 5–12 lb. of superphosphate. Being alkaline in reaction, ashes should not be used on alkaline or on heavy clay soils, neither should they be mixed with superphosphate, sulphate of ammonia, or guano.

### 34.24. Tanning Materials

34.24 : 12.2 : 33.35. FERNANDES, D. A. Het kunstmatig drogen van Java Wattle-bast (*Acacia decurrens* Willd.). **[The artificial drying of Java Wattle-bark (*Acacia decurrens*).]** *Tectona* 33, 1940 (465–81). [Du.]

Description of the design and functioning of two types of oven now in use, the fuels employed being firewood and charcoal, respectively.

## 34.25. Ornamental Trees

34.25. KLEECK, A. VAN. **Treating Christmas trees to make them safe from fire.** *Sth. Lumberm.* 161 (2033), 1940 (196). [Forest Products Laboratory, Madison, Wis.]

The method recommended for Spruce and Balsam Fir is that of keeping the tree standing in water.

34.25 : 12.2. LEBARRON, R. K., and SWAYNE, A. P. **Retarding needle fall on Black Spruce Christmas trees.** *J. For.* 38, 1940 (941–3). [Lake States Forest Exp. Sta.]

Standing the trees in a container of plain water was found to be the simplest and most effective of the treatments tested for retarding needle fall.

34.25 : 12.2 (77.6). O'SHANE, R. **Black Spruce rides the Yuletide and provides Christmas trees for a million dollar industry in Minnesota.** *Amer. Forests* 46, 1940 (541–3, 575).

Stunted Black Spruce grown in peat bogs in Minnesota make ideal Christmas trees, being symmetrical and having a compact crown and stiff branches. High stand densities make it possible to cut large numbers of these trees and still benefit the residual stand. With care Minnesota could supply 2½ million trees per year indefinitely.

34.25 : 12.2 : 23.27. COX, H. R. **The business of growing Christmas trees.** *Amer. Forests* 46, 1940 (554–6).

Notes on the selection of species and planting site, care of plantation, and marketing of trees.

## 34.26. Resin. Turpentine. Caoutchouc

34.26 : 12.2. KRESTINSKI, V., NOVAK, A., and KOMSHILOV, N. **Resin acids of coniferous trees. II. The structure of abietic acids.** *J. appl. Chem. U.S.S.R.* 12, 1939 (1514–28). [R.f.] Chem. Abs. 34 (6296). P.R.

34.26 : 12.2 : 12.11. TAMMES, P. M. L., and VLIES, A. P. VAN DER. Waarnemingen over het vloeien van hars bij *Agathis celebica* Koord. [**Observations on the flow of resin from *Agathis celebica.***] *Tectona* 33, 1940 (565–86). [Du.e.]

Report of studies on isolated trees in northern Celebes. About six layers of resin ducts were observed in the secondary phloem between cambium and phellogen. The ducts of very young branches contained an emulsion of small drops of resin in a watery solution. The osmotic pressure of this emulsion was about 35 atms. As the age of the branches increased, the emulsion became more and more concentrated until the watery solution was reduced to a few drops enveloped by a continuous mass of resin. The resin solidified in contact with the air, a process that took less time in the light than in the dark. The flow of resin from wounds was very strong at first, but gradually decreased and ceased altogether after about 12 hours, or else a small flow continued for four days or even longer. A tapping time of four days is suggested. Other conditions being equal, the amount of resin yielded varied in proportion to the number of the wounds. The quantity of resin given off by heavily tapped trees was so great that new resin must have formed during the flow. It is thought that normally the resistance of the wound, as determined by its size and condition of healing, is the limiting factor to resin flow, though the formation of new resin and the resistance in the capillary ducts may have an indirect influence on the flow.

34.26 : 12.2. FORD-ROBERTSON, F. C. **A first record of total channel occlusion in *Pinus longifolia*.** *Indian For.* 66, 1940 (710–6).

In two sets of channels for resin tapping in *Pinus longifolia*, one showed 60 per cent. of the channels healed after 40 years, and the other set, which healed more rapidly, showed 31 per cent. healing after only 20 years. The earliest complete healing was found only 10 years after tapping. Growth conditions in both cases were definitely above the average. *Author's summary.*

34.26 : 12.2. NIKOLAEV, N. F., SINELOBOV, E. A., and KHAYKIN, S. Kh. **The use of chemicals in making cuts in Pines.** *Lesokhim. Prom.* 1939 (6), (20–4); *Khim. Referat Zh.* 1939 (10), (121). Chem. Abs. 34 (7628). P.R.

$H_2SO_4$ was used in making cuts in Pines. The method consisted of alternate cuts of the cambium and bast by means of a special tool with a simultaneous covering of the cuts with $H_2SO_4$. Compared with the ordinary German method the new method gave a considerably

increased yield of turpentine. The consumption of $H_2SO_4$ was about 10 kg. per ton of turpentine.

34.26 : 12.2. BARABANOV, P. N. ***Acer platanoides* as a rubber plant.** *Ann. White Russ. Agric. Inst. Gorki* 1939 [8 (30)], (77–8). [R.] Hort. Abs. 10 (1490).

Analyses made at the laboratory of the U.S.S.R. Rubber Institute of sap, leaves, seed and shoots of *Acer platanoides* showed that they all contained rubber latex and resins. Most of the latex (1·1 per cent.) was found in the sap.

## 34.27. Leaf Fodder

34.27 (54) LAURIE, M. V. **Fodder trees in India.** [Forest Research Institute, Dehra Dun?] 1939. pp. ii + 17.

Trees, shrubs, and climbers that are lopped for fodder in different provinces are grouped in three fodder-value categories, namely, good, medium, and poor or so far unclassified. The list does not make any claim to scientific accuracy but merely represents the consolidated opinions of forest officers throughout India regarding the relative popularity of the different species for this purpose.

## 34.6. *Utilization of Milling and Logging Waste*

34.6 : 07.7. **New machine removes bark from slabs and edgings.** *Sth. Lumberm.* 161 (2027), 1940 (45).

Slabs are carried through the machine on feed conveyors and the bark is removed by hydraulic jets. Slabs up to about 16 in. wide and a maximum thickness of 10 in. can be barked at the rate of 4 cords an hour if this represents a lineal measurement of about 800 feet.

34.6 : 31.24 : 07.7 (78–9). BEECHER, H. W., and WATT, R. D. **Combustion of waste-wood products.** *Combustion* 12 (3), 1940 (35–8). L.S.

A review of the economics and availability of hog fuel, with particular reference to the Northwest, its thermal value and combustion characteristics, and the types of furnaces generally employed for burning it. The relatively low cost of this fuel has not encouraged engineering research that might involve greater capital investment leading to its more efficient use. *From authors' summary.*

34.6 : 33.35 : 07.7. STEVENS, W. C., and STEEL, E. A. **Drying sawdust: standardized emergency equipment to meet present conditions.** *Wood* 6, 1941 (19–21). [Forest Products Research Laboratory, Princes Risborough, Bucks.]

Experimental equipment devised by the Forest Products Research Laboratory to provide cheap, easily obtained, and semi-portable plant for drying sawdust, is described. The plant incorporates a suction fan and cyclone system for collecting the sawdust, which is dried over a wood-burning furnace. The fan is driven by a $1\frac{1}{2}$ h.p. motor and is the only power-driven unit employed. The test data presented show that sawdust having an initial moisture content of about 60 per cent. would need to be passed through the apparatus three times before the requisite amount of moisture was removed. The output of material dried from an initial moisture content of 60 per cent. would be roughly 300 lb. per hr.

## 37. FOREST TRANSPORT

37 : 33.32 : 33.0 : 07.7. **Handling pulpwood into and out of ships.** *Pulp Paper Mag. Can.* 41, 1940 (838–9).

A method of loading and unloading of pulpwood in 2- or 4-ft. lengths by means of flooding the relatively small compartments into which the cargo holds are subdivided by watertight bulkheads. It is estimated from tests on models that rates of loading and unloading as high as 300 to 400 cords per hour are possible. The method has not been used in actual practice as yet.

37 : 33.32 : 33.0 : 32.5. WETMORE, L. L. **Pulpwood hauling by trucks and sleighs.** *Pulp Paper Mag. Can.* 41, 1940 (840–6). [Price Brothers & Co., Ltd.]

Report of a winter truck-hauling operation of 11,906 hundred cu. ft. of pulpwood in Quebec. Details are given of road construction and maintenance, loading, unloading, equipment, and costs of cutting and hauling.

37 : 38. PEARCE, J. K. **Truck and tractor logging demands intensive engineering.** *Timberman* 41 (12), 1940 (46–51).

The application of engineering principles is

required in the solution of the complex logging problems in the Pacific northwest of the United States, and neglect of engineering in the development of truck logging has resulted in many costly mistakes.

37 : 38 (54.2). BRAHMAWAR, R. N. **A short note on the export arrangements from the forests in Sarda Valley.** *Indian For.* 66, 1940 (583–92).

With particular reference to the use of wire ropeways in extracting timber over precipitous country.

37 : 82 : 32.5. ROONEY, H. N. **Time studies in tractor logging.** *W. Cst. Lumberm.* 67 (10), 1940 (48s–t). [Potlatch Forests, Inc., Lewiston, Idaho.]

Discussion of methods used in making time studies and of the application of data obtained.

## 38. FOREST CONSTRUCTIONAL WORKS. FOREST ENGINEERING

38 (213). DESCH, H. E. **Timber buildings in the tropics.** Forest Research Institute, Kepong, Malaya. 1940. pp. 42.

The first part of this bulletin deals with problems connected with the utilization of timber in wooden buildings in the tropics, with special reference to protection against subterranean and drywood termites, powder-post beetles, and fungal attack. The second part contains plans, specifications, and quantities for all-timber labourers' buildings. The capital cost of such wooden buildings is one-half to two-thirds that of similar concrete or brickwork structures, and upkeep costs, excluding internal painting, should not exceed 0·25 per cent. per annum of the capital cost. Available information indicates an economic life of 25 to 50 years. This is less than can be expected from properly constructed concrete houses, but it is pointed out that, if the plans and specifications are followed, the wooden buildings will remain immune to subterranean termites, and this cannot be claimed for many so-called permanent buildings.

38 : 33.15 : 33.4. **Plywood houses.** *Wood* 5, 1940 (286–90).

Constructional details of the *Life* House No. 1, built by methods developed by the U.S. Plywood Corporation.

38. CORNWALL, G. F. **An outstanding timber railway span.** *Timberman* 41 (12), 1940 (12–6).

Description and drawings of timber bridge having total length of 1,130 ft. and height of 235 ft. It consists of an untreated Douglas Fir pile bent approach of 250 ft., a centre section composed of a pressure-treated Douglas Fir three-hinged arch, with a framed timber superstructure 480 ft. long, and an approach of driven pile bents of 400 ft.

38. FITZHERBERT, J. T. **Forest roads.** *Quart J. For.* 35, 1941 (7–11).

Note from experience gained in the construction and repair of forest roads in the Lake district, with special reference to the utilization of local materials such as thinnings, brushwood, and slabs.

38 : 07.7. LEVIE, C. G. **Winter truck roads.** *Pulp Paper Mag. Can.* 41, 1940 (836–7). [Laurentide Equipment Co., Ltd.]

Description of the equipment on a tank truck, which is used for distributing bituminous materials on hard-surface roads, and which, it is suggested, could be used efficiently in icing winter hauling roads.

38 : .82. LUKKALA, O. J. Metsäojien kaivun työaikatutkimuksia. [**Time studies of forest drainage operations.**] *Comm. Inst. for. Fenn.* 28 (3), 1939–40. pp. 92. [Fi.g.]

Report on detailed investigations under various sets of conditions representative of Finland. The drainage operations were carried out in summer. The chief purpose of the studies was to determine the influence on the rate of work, in terms of time required to dig 1 cu. m. of ditch, of the resistance of the soil, the depth of the ditch, and the angle of its slopes. The time required to dig 1 cu. m., including all operations connected with the digging, and not only spade work proper, which, on an average, occupied only 57 per cent. of the time spent on such operations, varied from about 20 to 100 minutes, according to the resistance of the soil. The optimum depth of ditches, as far as rate of work is concerned, was about 1·4–1·5 m. in the 'easier' soils, and decreased in the more 'difficult' ones to 1 m. or less. Ditches deeper or shallower than optimum depth took longer to dig, in terms of time per cu.m. Work was also slower the slighter the angle of the slopes, especially in soils of relatively high resistance.

## 42. PROTECTION AGAINST INJURIES FROM INORGANIC AGENCIES

42 : 12.2 : 21.3. KREAG, K. K. **Nature and control of shade tree chlorosis in Lansing, Michigan.** *Proc. nat. Shade Tree Conf.* 16, 1940 (32–8).

Chlorosis of shade trees in this locality is due mainly to deficiency of minor soil elements. Soil treatment with iron sulphate and powdered sulphur has been successful under certain soil conditions, and application of manganese sulphate to the soil has proved effective in many but not nearly all cases. Good results have been obtained by treating trees with sprays containing iron sulphate or manganese sulphate, but the improvement lasts only one season and reliable soil treatments giving more permanent results are the real desideratum.

42 : 12.2 : 21.3 : 11.47 : 11.43. LUDBROOK, W. V. **Needle fusion of *Pinus* in southern New South Wales. Second progress report (1937-38).** *Pamphl. Coun. sci. industr. Res. Aust.* No. 89, 1939. pp. 20. [Division of Plant Industry, C.S.I.R.].

42 : 12.2 : 21.3 : 11.47 : 11.43. YOUNG, H. E. **Fused needle disease and its relation to the nutrition of *Pinus*.** *Bull. Qd. For. Serv.* No. 13, 1940. pp. 108.

The distribution of fused-needle disease of *Pinus* in Australia and other countries, together with the various symptoms connected with the trouble and the species of *Pinus* affected, are discussed. The typical fused-needle condition is thought to be only one of a number of closely-related abnormalities. The economic importance of the disease, as affecting coniferous plantations, is considered. It appears that the trouble is a limiting factor in the establishment of exotic Pines in certain localities.

Experiments showed that all factors save soil have no direct influence on the condition. Genetic factors are thought to act in a secondary manner. In connexion with soil factors, it is considered that minor elements and the physical nature of the soil can be dismissed as primary causes. The action of phosphorus in relation to Pine nutrition is found to be of major importance. The organic-matter complex appears to be fundamentally related to the occurrence of the trouble, and a number of experimental observations concerning this are described and discussed.

Success in the control of fused needle and related abnormalities by the use of phosphatic manures was obtained in a number of field experiments. The theoretical background of this work is discussed and the experiments described. It is thought that the fertilizers act chiefly in a secondary manner by stimulating the production of organic matter and by aiding the development of a satisfactory mycorrhizal complex. The practical application of fertilizer treatment in general plantation practice is described and discussed. The development of the knowledge of mycotrophy is briefly reviewed, and a general mycorrhizal theory to explain the cause of fused-needle disease is advanced. Normal and abnormal mycorrhiza are discussed in relation to the occurrence of fused-needle disease and related conditions. The unsatisfactory mycorrhizal condition is associated in the case of the majority of fused-needle sites, with a low total phosphate value in the soil. The relative absence of surface litter formation is considered to be due to this deficiency. The lack of raw organic matter possessing a relatively high phosphate content is thought to be conducive to the development of faulty mycorrhizal systems, with resultant abnormal growth in the trees.

A carbohydrate hypothesis for the physiologic rôle of tree mycorrhizas is propounded as an adjunct to the nitrogen-mineral salt theory, and experiments supporting this contention are described. According to this hypothesis, normal mycorrhizas supply the tree with an essential part of their carbohydrate supply, and it is to the inefficient functioning of the mycorrhizas in this respect that the fused-needle condition is due. The supply of additional phosphorus to soils low in this element results in a more abundant phosphatide excretion from the Pine roots, thus stimulating normal mycorrhiza formation and bringing about a satisfactory balance of conditions for correct mycotrophic activity. The amount of vegetable detritus present is important in this respect, as it is from this source that the carbohydrate supplied to the higher plant by the mycorrhizal fungus is obtained. The addition of phosphates to the soils in question stimulates the growth of natural vegetation, and thus aids the development of the necessary supply of vegetable detritus. *Author's summary.*

## 42.3. *Precipitations and their Effects*

42.3. HAAKH. Schneebruch—Merkmale und Richtlinien. **[Snow breakage—characteristics and protective measures.]** *Dtsch. Forstw.* 22, 1940 (169–72). [G.] Biol. Abs. 14 (15340).

Protective measures include the draining of wet land to improve root growth; avoidance of clear fellings on wet land and at high altitudes; wide spacing at high altitudes, avoidance of dense, even-aged stands of conifers at medium altitudes; choice of suitable mixtures of species; and early, light, and frequent thinning.

## 43. FOREST FIRES

43. RICHARDS, L. W. **Effect of certain chemical attributes of vegetation on forest inflammability.** *J. agric. Res.* 60, 1940 (833–8). [Northern Rocky Mt. Forest & Range Exp. Sta.]

Moisture content, crude fat, and calorific determinations were made on leaves of shrubs and aerial parts of grasses and forbs that are typical of the open forest areas of northern Idaho. Only green or curing material was used. Evaporation tests were made to determine the rate of water loss at moderately high temperatures, as the tenacity with which a plant holds its free or chemically combined moisture may determine its effect on the rate of spread of forest fire. It is concluded that quantitative variations in the moisture content of the vegetation appear to exert a dominant influence on its fire behaviour, that the moisture content of plants of each species studied varied widely, and that moisture content decreased as the season advanced.

43 : 09.4 (71). WRIGHT, J. G. **Long-term trends in forest-fire statistics in Canada.** *For. Chron.* 16, 1940 (239–44). [Dominion Forest Service, Ottawa.]

From 1918 to 1939 the long-term trend in the yearly number of forest fires shows an increase of about 11 per cent. while there is a decrease of about 53 per cent. in the acreage burned over each year and, between the years 1923 and 1939, a decrease of about 22 per cent. in the trend of damage and loss. It is concluded that the size of the average fire has decreased 58 per cent. in 22 years.

43 : 09.4 (71.4). Les incendies forestiers en 1940. **[Forest fires [in Quebec] in 1940.]** *La Forêt Québecoise* 3 (1), 1941 (39–40). [F.]

43 : 11.16 : 11.2 (71.5). WRIGHT, J. G. **Sun spots and forest fires in New Brunswick.** *For. Chron.* 16, 1940 (233–8). [Dominion Forest Service, Ottawa.]

Analysis of annual forest-fire statistics for New Brunswick and annual sun-spot data indicates that severe fire conditions, as evidenced by the total area burned over, coincided with periods of minimum sun-spot activity, and conversely that periods of low fire occurrence coincided with periods of maximum sun-spot activity. As a basis for this it is further shown that during forest-fire seasons, mean maximum temperatures average about 2° higher, rainfall about 1½ in. lower, and duration of bright sunshine is about 4 per cent. greater at the sun-spot minimum than at sun-spot maximum. Based on the projection of the sun-spot curve a forecast is made of the probable area that might be burned over during the next ten years, though with the qualification that the forecast contains many possible sources of error. It is pointed out that the relationship between fire occurrence and sun-spot activity is reversed in Manitoba and Saskatchewan.

43 : 81. CURRY, J. R., GRAY, L. G., and FUNKE, I. C. **Forest fire-danger rating and its application in California.** *J. For.* 38, 1940 (855–66). [California Forest & Range Exp. Sta.]

A theoretically perfect fire-danger system is outlined showing the factors that are recognized as influencing measurement of fire behaviour and the application of these measurements to organization changes. Limitations to the application of the theoretical system are recognized and it is suggested that an approach to it could be made through the use of certain fire-danger and presuppression indexes when sufficient data have been obtained. For the system now in use in California such indexes have been developed, within the limits of available data, for ignition, spread, lightning ignition, and fire load. Each index is formulated on a scale of 0 to 10. Broadly the ignition index represents the influence of wind velocity and fuel moisture on ignition in many fuel types, the lightning index represents the relative probability of lightning fire based on lightning-storm conditions, the spread index represents the relative increase in fire perimeter for different types and slopes, and the fire-load index is obtained by multiplying the ignition index by the spread index. Other factors that should be considered in fire-danger rating include human use,

season, and visibility. At present the first two are evaluated by local officers and the third is considered as affecting the detection organization only.

Organization requirements vary in accordance with fluctuations in fire load and seven classes of organization are defined on this basis, ranging from 'no fire danger' to 'full emergency'. While the class of organization requirements is determined primarily from the fire-load index, it may be modified locally by reference to visibility, use and season (as measured by the phenological stage of herbaceous vegetation). The application of the method in field practice is described.

## 43.1. *Protective Measures*

43.1. MUNRO, R. **Fire suppression.** *Fire Control Notes* 4, 1940 (185–9). [Southwestern Region, U.S. Forest Service.]

Back-firing technique is discussed with reference to the Ponderosa Pine type. It is suggested that after fire lines are cut the timber on the ground should be cleared before back-firing. The light fuels of this forest type allow of relatively easy removal, and clearing before instead of after back-firing is both faster and safer.

43.1 : 07.7. HEADLEY, R. **Wings and parachutes over the National Forests.** *Fire Control Notes* 4, 1940 (181–4).

A brief review of the use of aircraft and parachutists in forest-fire control. For locating fires, aeroplanes are used chiefly on special detection flights after lightning storms and for the scouting of going fires. A useful method is to develop aerial pictures and drop them to the chief of the fire party on the ground. During the last ten years the major field of usefulness for aircraft has been in the transportation of supplies. Parachuting of men to fires is technically practicable; the use of steerable parachutes allows them to land very close to the mark, and special equipment renders the landing on trees fairly safe and less wasteful of time than under earlier conditions. However, it is not certain as yet whether this method of transportation is economical. So far, not one employee of the Forest Service has been killed in twenty-two seasons of aerial fire control.

43.1 : 07.7. ANDERSON, F. H., and KRUSE, G. W. **Improvements in backpacking the portable pumper equipment.** *Fire Control Notes* 4, 1940 (201–6). [Superior National Forest.]

The equipment described and illustrated includes a form-fitting pack frame for marine pumpers, and a new type of hose pack and a splash-proof petrol can, each of which are mounted on a form-fitting pack frame.

43.1 : 07.7 : 23.7. DANNFELT, M. J. Skumsläckning vid skogseld och hyggesbränning. **[Foam extinguishing in forest fires and slash burning.]** *Skogen* 27, 1940 (291–2). [Sw.]

Further trials have been made with the 'Brandklippare' foam sprayer [*For. Abs.* 1 (103)], which has been used after a spell of drought on two areas with highly inflammable ground cover, consisting in one case of half-dry Juniper bushes with tall sedges and Heather, and in the other of a thick layer of Spruce slash. Belts round these areas were cleared of slash and shrubs, and a double foam track was laid down. In both cases this proved an effective fire barrier, except for isolated spots where particularly heavy gusts of wind blew the flames downwards and across the first foam track. To guard against such occurrences it is advisable to space the foam tracks at least 0·5–1·0 m. apart. One fire was purposely allowed to cross both barriers and was then easily checked by a direct frontal attack with two sprayers. At least 2 men are required to work the sprayer, and a team of 3 is to be preferred: one man to pump, a second to handle the hose, and a third to fetch water and to refill with foam liquor. The chief advantage of the apparatus is the small quantity of water required, and the chief disadvantages are its relatively high cost and the fact that it will lay only about 20 m. of foam track on one filling, though refilling is simple if water is near at hand. Its chief uses appear to be the checking of forest fires in their earliest stages and preventing fire spreading from areas where slash is being burnt.

43.1 : 22.14 : 23.7. OSBORNE, W. B. **Protection problems in selective logging.** *W. Cst. Lumberm.* 67 (10), 1940 (48b–d). [U.S. Forest Service, Portland, Oregon.]

Preliminary report of a study of fire-hazard conditions on various selectively logged areas in the Douglas Fir and Spruce/Hemlock types of western Oregon and Washington. Tentative personal opinions are given by the author as to desirable protective measures to be undertaken.

43.1 : 23.22 : 12.2. LAMPE, M. Cultuurstrooken als brandbescherming in Indramajoe. **[Cultivated strips as fire barriers in Indramayu.]** *Tectona* 33, 1940 (488–9). [Du.]

In this region Teak plantations situated within Lalang (*Imperata cylindrica*) areas are especially endangered during August to October, when the prevailing winds blow from the south-east. The method of protection described consists essentially in planting Teak on burned and cleared strips of at least 200 m. width on the windward side of last year's plantations. Owing to complete absence of litter and weeds the newly planted strip is practically immune from fire and thus protects the stands on the lee.

43.1 : 81. HANSON, P. D., FUNKE, I. C., and TURNER, E. L. **A study of the volume and location of the fire load and the determination of an effective pre-suppression organization to handle it.** *Fire Control Notes* 4, 1940 (161–72). [Region 5, U.S. Forest Service.]

The procedure employed in northern California is exemplified by the study made for the Plumas National Forest. Fire hazard was evaluated using rate-of-spread and fire-occurrence data from past experience, and an estimate was made of such anticipated changes as are due mainly to changes in industrial occupancy. A system of stations was then selected so as to cover most effectively the various hazard areas within set time limits and with as little duplication as possible. Where practical a treatment was prescribed for areas not within reach of a suppression force in a reasonable time. Finally, size of crew required for initial attack and the best location for tank trucks were determined.

43.1 : 81. **Progressive step-up organization.** *Fire Control Notes* 4, 1940 (173–7).

The special feature of this method of line construction is that the entire crew progresses forward with each member occupying the same relative position throughout the work period.

43.1 : 81. **Intensified protection of Wyoming Valley forests against fire through use of community labor.** *Anthrac. Surv. Pap. Allegh. For. Exp. Sta.* No. 2, 1940. pp. 7 + 5 maps.

## 44. PROTECTION AGAINST DAMAGE BY HARMFUL PLANTS

### 44.1. *Forest Weeds*

44.1. DURANT, C. C. L. **The control of some common forest weeds.** *Malay. For.* 9, 1940 (157–65).

Climbers, including *Vitis* spp., *Mikania cordata*, *Eupatorium odoratum*, and various woody climbers, are generally best left alone; they are mostly strong light demanders, and regeneration will gradually push through and suppress them as the canopy forms. Control by cutting back and similar operations is generally either ineffective or too costly, but where heavy invasion is feared cautious opening of the original canopy is likely to prove a good preventive measure, and cleaning of the regeneration should be delayed until fresh canopy is formed. The fern *Gleichenia linearis* is also a climber, but unlike the above species it is a serious pest. Good results have been obtained by cutting back every living frond of the fern but leaving all other vegetation intact. Danger from *Nephrolepis biserrata* may be minimized by delaying cleanings for 4 or more years after felling and cleaning as little as possible. The control of *Acrostichum aureum* has been fully described in *Malay. For. Rec.* No. 6, 1928. *Eugeissona triste*, a stemless Palm, is best controlled by cutting back the fronds as close as possible to the ground and repeating if necessary after two years. This operation weakens the clumps enough to allow regeneration to get away. For two other Palms, *Arenga westerhoutii* and *Oncosperma horrida*, the most promising measure appears to be deep notching of the stem and filling the notch with poison.

44.1 : 12.2. SCOTT, J. D. **The eradication of thorn trees.** *E. Afr. agric. J.* 6, 1940 (91).

The application of power or ordinary paraffin, either by spray or brush, to the bark of the tree just below ground level resulted in 60 per cent. of the trees being dead and 30 per cent. in a dying condition within a year of the treatment.

### 44.3. *Fungi*

44.3. TILFORD, P. E. **Tree wound dressings.** *Proc. nat. Shade Tree Conf.* 16, 1940 (41–51). [Ohio Agricultural Exp. Sta.]

In trials undertaken by the Ohio Agricultural Experiment Station liquid asphaltum (asphaltum in a light, volatile hydrocarbon solvent) was the best of a number of wound dressings used; it consistently stimulated callus formation during the year following wounding and treatment, and was better than the other preparations in preventing cracking of the

wood. A water/asphaltum emulsion also stimulated callus formation, but was less effective than liquid asphaltum and weathered off more quickly. Asphaltum dissolved in creosote injured Elm, Maple, and Hickory, and is considered unsuitable for general use on the living tissues of tree wounds. Bordeaux/linseed-oil paint retarded callus formation when applied to fresh wounds, and weathered more rapidly than liquid asphaltum; in spite of its high fungicidal value it is not considered satisfactory as a general-purpose wound dressing. Waterglass was of no value as a wound dressing. Avenarious carbolineum caused injury to Maple, Elm and White Oak, even when treatment was deferred until a month after wounding. It is an excellent preservative and may be of value for treating heartwood, but should not be used on living tissues. Lanolin containing indole-butyric acid failed to simulate callus formation, but further efforts should be made to determine the possible uses of growth substances in wound dressings. Washing the wounds with alcoholic or aqueous solutions of mercuric chloride and colloidal sulphur was not injurious. Lead paint and Rexspar varnish had no effect upon healing; they gave fairly good covering for the first year if the wounds were dry when they were applied. Varnish was slightly more durable than paint. In the author's opinion, the prime requirement of wound dressings is that they should exclude infection by providing a good covering and preventing the formation of cracks during the healing period, though the incorporation of strong fungicides may be valuable where virulent diseases, such as the Plane-tree disease, are involved.

44.3. HENRY, B. W., and WAGNER, E. C. **A rapid method of testing the effects of fungicides on fungi in culture.** *Phytopathology* 30, 1940 (1047–9). [University of Wisconsin, Madison.]

44.3 : 12.2 : 24.3. GRANT, T. J., and CHILDS, T. W. ***Nectria* canker of northeastern hardwoods in relation to stand improvement.** *J. For.* 38, 1940 (797–802). [Bureau of Plant Industry, U.S.D.A.]

Data are analysed from 75 widely scattered sample plots, mostly in New Hampshire and Vermont, and from strip surveys in moderately to severely cankered stands. The frequency of *Nectria* cankering on a given tree species may vary greatly. While the relative susceptibility of the principal hardwood species was not the same on all areas, in general Yellow Birch was more susceptible than Paper Birch, Red Maple, and Sugar Maple. Beech was uninfected in most stands and only lightly infected in others. Cankering of highly susceptible commercial hardwoods was positively correlated with elevation, abundance of weed hardwoods, and degree of purity of the stand. Correlations between cankering and d.b.h. ranged from highly significant (positive) to slightly negative. The average number of cankers per infected tree was usually so large as to suggest the existence of inherent differences in susceptibility within the various host species. As cankering is so variable in occurrence, specific control measures must be adapted to each stand or portion of stand to be treated. In general, emphasis should be given to discrimination against weed and badly cankered trees, and the formation and maintenance of well-mixed, vigorous stands. *From authors' summary.*

44.3 : 12.2. CARTER, J. C. **Diseases of Oaks and *Verticillium* wilt of woody plants.** *Proc. nat. Shade Tree Conf.* 16, 1940 (83–91). [Illinois State Natural History Survey, Urbana.]

Brief descriptions are given of various diseases dealt with in a previous article [*For. Abs.* 2 (194)] and of other canker, die-back, and leaf-blight diseases of Oaks caused by *Phomopsis quercina*, *Phoma* sp., *Phoma quercina*, *Fusicoccum ellisianum*, *Sphaeropsis quercinum*, *Bulgaria inquinans*, *Coniothyrium* sp., and a new species of *Pyrenochaeta*. Control of these can generally be effected by removing the diseased parts, followed by disinfection and painting of wounds.

A short account is also given of the wilt disease of many hardwoods caused by *Verticillium albo-atrum*. Results of preliminary experiments suggest that pruning and feeding the affected trees may be beneficial, even if complete control is not achieved.

44.3 : 12.2. MARTIN, J. F. **The application of surgery to blister rust infected trees of ornamental value.** *Proc. nat. Shade Tree Conf.* 16, 1940 (113–20). [Bureau of Entomology and Plant Quarantine, U.S.D.A.]

The Pine blister-rust disease caused by *Cronartium ribicola* is briefly described and directions are given for the surgical treatment of infected Pines that are valuable ornamental trees. Under arboricultural conditions the cost of such treatment is often less than that

of removing or replacing the trees. Surgical treatment is useless unless bushes of *Ribes* are cleared from the neighbourhood to prevent re-infection.

44.3 : 12.2. KROEBER, J. K. **Annual report of White Pine blister rust control, calendar year 1939.** Michigan Department of Agriculture. [1940.] pp. 53.

Considerable progress was made during the year under review with regard to *Ribes* eradication from stands and nurseries, the elimination of cultivated Black Currant, and pre-eradication surveys.

44.3 : 12.2. MCKENZIE, M. A., and JOHNSON, E. M. ***Cephalosporium* Elm wilt in Massachusetts.** *Bull. Mass. agric. Exp. Sta.* No. 368, 1939. pp. 24. [Massachusetts State College, Amherst.]

The *Cephalosporium* wilt of Elm in Massachusetts is a typical vascular mycosis and can be distinguished from other diseases of a similar nature only by means of laboratory cultures. The cultural studies described in this paper showed *inter alia* that the fungus may possibly be spread within the tree by means of internal transport of the spores. Inoculations of *Ulmus americana* L. and its variety *ascendens*, *U. campestris* L., *U. parvifolia* Jacq., *U. pumila* L., and *U. glabra* L. var. *fastigiata* Rehd., showed that all could be infected through fresh leaf wounds, and all but the last-named through fresh twig wounds; thus comparable injuries by insects may serve in nature to disseminate the fungus. The findings of the writers agree with previous results obtained in New England, but show some discrepancy with those from Nebraska, indicating that more than one strain or species of *Cephalosporium* may be involved. Tentative suggestions for control include the removal of all damaged parts of the trees, sealing of wounds, spraying, and watering and feeding to maintain vigour.

44.3 : 12.2 : 13.2. FELT, E. P. **European Elm bark beetle and Dutch Elm disease control.** *J. econ. Ent.* 33, 1940 (556–8). R.A.M. 19 (680–1).

The author is convinced that the incidence of *Scolytus multistriatus* in the eastern United States is chiefly local and that it is largely confined to diseased or dying wood. The normal limit of flight suggests that ordinarily there would be no extensive invasion from neighbouring regions; thus the immense numbers of beetles in New Jersey in 1937 did not materially increase the number of infected trees in New York in the following year. The available data, though inconclusive, suggest that local control may be possible by two or three mid-summer prunings and the immediate burning of weak wood.

## 45. PROTECTION AGAINST DAMAGE BY ANIMALS

### 45.3. *Insects*

45.3 : 05.3 (492). HOLLAND. Jaarverslag over 1939. Comité ter bestudeering en bestrijding van insectenplagen in bosschen. **[Annual report for 1939 of the Committee for the Study and Control of Forest Pests.]** *Tijdschr. Heidemaatsch.* 1940. Repr. pp. 11. R.A.E. A28 (499–500).

The chief pest observed was again *Diprion pini* L. on Pines. Trees over about 2,500 acres were threatened with destruction in the province of Utrecht alone, but valuable stands were saved by applying a dust consisting of a cheap carrier and a combination of low-strength pyrethrum and derris powders. Dusts containing pyrethrum mixed with either derris or calcium cyanamide were effective against sawfly larvae on Larch and Spruce and did not injure the trees. Considerable injury was caused to Larch in some localities by *Coleophora laricella* Hb., and some trees were killed. *Nygmia phaeorrhoea* Don caused local defoliation of Oaks. Observations on larval nests of this species lying on the ground and crushed but not burnt showed that the larvae died in those crushed before 1st November, while many survived in those crushed later. In control experiments the best results were obtained by dusting with pyrethrum against the younger larvae and with derris against the older ones, but crushing the nests is still considered the most effective measure.

45.3 : 09.4 (71). BROWN, A. W. A. **A note on the gross estimate of forest insect damage in Canada.** *For. Chron.* 16, 1940 (249–54). [Division of Entomology, Department of Agriculture, Ottawa.]

Figures are given for a gross estimate of the damage by eleven of the more destructive forest insect species during the past decade and for 1939, the latter totalling 2,680,800 cords.

45.3 : 12.2 : 13.2 : 31.43 (47.4). BRAMMANIS, L. Latvijas mežu kaitēkļu apskats. **[A review of the forest pests of Latvia.]** *Mežkopja*

*darbs un zinatne* No. 1/2, 1940 (257–340). [Latv. g.]

The predominance of mixed stands and the climatic conditions of Latvia prevent the occurrence of primary insect pests. Bark beetles, chiefly *Blastophagus piniperda* and *B. minor* in Pine, *Ips typographus* and *Pityogenes chalcographus* in Spruce, and *Eccoptogaster* (*Scolytus*) *ratzeburgi* and *Hylesinus fraxini* in broadleaved trees, are the most common secondary pests. They frequently cause damage in districts where transport difficulties and labour shortage prevent felling and extraction of inferior timber. Damage to seed has been caused almost entirely by *Laspeyresia strobilella*, which attacked numerous Spruce stands during 1937–8. The greatest damage to forestry production is caused by those insects which attack young plantations, and especially by *Hylobius abietis* and *Melolontha hippocastani*. Control of these insects is still in an experimental stage. So far, satisfactory results have been obtained in the control of *H. abietis* by spraying Pine plantations with a 10 per cent. solution of 'Hylarsol', and in the control of *M. hippocastani* by ploughing plantation areas in the year preceding the flight, the planting being done in the early spring of the year of flight, which in Latvia occurs at regular intervals of 5 years. Among insects attacking dead timber, *Hylotrupes bajulus* is the only one of economic importance. It is found in walls of wooden houses in the coastal zone.

45.3 : 12.2. HOUSER, J. S. **Some troublesome pests of conifers.** *Proc. nat. Shade Tree Conf.* 16, 1940 (65–79). [Ohio Agricultural Exp. Sta.]

Brief notes are given on a number of common insect pests of conifers and on their control under arboricultural conditions.

45.3 : 12.2 : 13.2 : 32.2. CAMERON, A. E. **The effect of felling on the incidence of forest insect pests.** *Scot. For. J.* 54, 1940 (46–52).

*Hylobius abietis*, *Pissodes notatus*, *P. pini*, *Myelophilus piniperda*, *M. minor*, *Hylastes ater*, and *Pityogenes bidentatus*, are the chief pests to develop under conditions of felling in British coniferous woods. The most effective single method of checking the increase of these weevils and bark beetles is to let them lay their eggs in the timber and to strip the bark from the stems while the spring brood of grubs is as yet immature. The brood is destroyed and the peeled bark, which shelters predators and parasites of the brood, is left where it falls.

45.3 : 12.2 : 13.2. BROMLEY, S. W. **Aphids of coniferous trees.** *Bull. Bartlett Tree Res. Lab.* No. 3, 1939 (36–9).

Brief notes on various aphids infesting ornamental conifers. All may be controlled by thorough application of a good contact insecticide before the aphid population is large enough to produce noticeable injury.

45.3 : 12.2 : 13.2 : 23.5. ALTMANN, T. Die Erle als Vorwald. **[Alder as a nurse crop.]** *Forstarchiv* 16, 1940 (92–6). [G.] Biol. Abs. 14 (15332).

Mixtures of Pine, Spruce, and Alder have been used in recent plantations in the Nuremberg State Forest with the object of reducing the serious losses formerly caused by insect pests (moths) in pure stands of Pine. *Alnus glutinosa* and *A. incana* have grown vigorously on the coarse sandy soil after deep ploughing, liming, and removal of competing vegetation; they have created favourable conditions for the conifers and the latter now promise to make a highly productive forest resistant to insect attack. *Robinia pseudoacacia* and 'Canadian' Poplar, also tried as nurse trees, suffered from frost and drought. Birch was almost as good as Alder but suffered from browsing by deer.

45.3 : 12.2 : 13.2. HASEMAN, L. **The spring cankerworm and its control.** *Circ. Mo. agric. Exp. Sta.* No. 205, 1940. pp. 4. R.A.E. A28 (517).

*Paleacrita vernata* Peck has often completely defoliated large trees in Missouri, particularly Elm and Hackberry (*Celtis*), in early spring. Notes are given on the life history of the insect and on arboricultural control measures such as spraying and banding.

45.3 : 12.2 : 13.2. NAUDÉ, T. J., RIPLEY, L. B., and PETTY, B. K. **Wattle bagworm control by aeroplane dusting.** *Sci. Bull. Dep. Agric. S. Afr.* No. 206, 1939. pp. 12. R.A.E. A28 (641).

Dusting with natural cryolite by means of power dusters is a practicable means of controlling *Acanthopsyche junodi* Heyl. on Wattle over limited areas where dusting of a given district can be completed within three weeks. A rate of 20 lb. per acre is recommended for application in aeroplane dusting, as it was found to be as effective as larger rates applied from the ground.

45.3 : 12.2 : 13.2. RIPLEY, L. B., PETTY, B. K., and HEERDEN, P. W. VAN. **Further studies on gustatory reactions of the Wattle bagworm (*Acanthopsyche junodi* Heyl.).** *Sci. Bull. Dep. Agric. S. Afr.* No. 205, 1939. pp. 20. R.A.E. A28 (640–1).

45.3 : 12.2 : 13.2. DOWDEN, P. B., SELLERS, W. F., and MILLER, F. E. **Establishment in the United States of *Microplectron fuscipennis* Zett., a parasite of the European Spruce sawfly.** *J. For.* 38, 1940 (972–4). [Bureau of Entomology & Plant Quarantine, U.S.D.A.]

Collection and examination of sawfly cocoons, following the extensive liberation of *Microplectron* in the States of Maine, New Hampshire, Vermont, and New York, indicated that the parasite had become well established throughout the infested area and that a significant degree of parasitization had taken place in some areas, although it is considered too early for an evaluation of the ultimate effectiveness of this method of control.

45.3 : 12.2 : 13.2. GOBEIL, A.-R. Serait-ce la fin de la mouche à scie européenne de l'épinette. **[May this be the end of the European Spruce sawfly?]** *La Forêt Québecoise* 2 (10), 1940 (18–20).

A decrease, during 1940, of the *Diprion polytomum* population is reported from Quebec. It is attributed chiefly to the widespread destruction of larvae by a new disease which appears to be caused by a virus. Owing to the fact that in Quebec the pupal stage of the sawfly usually extends over several years, this decrease must at present be regarded as temporary.

45.3 : 12.2 : 13.2. DOWDEN, P. B. **Larval disease prevalent in heavy infestation of the European Spruce sawfly in southern New Hampshire and Vermont.** *J. For.* 38, 1940 (970–2). [Bureau of Entomology & Plant Quarantine, U.S.D.A.]

A disease, the causative organism of which has not yet been discovered, is reported to have killed large numbers of larvae of *Gilpinia polytoma* in southern New Hampshire and Vermont during 1939. The progressive effect of the disease is recorded from daily observations on a ¼-acre study plot in a heavily infested stand.

45.3 : 12.2 : 13.2. MATTOON, H. G. **Insects injurious to Pines.** *For. Leaves* 30 (6), 1940 (1–2, 10–1).

Brief notes on description, feeding habits, damage by, and control of sawflies, European Pine shoot moth, Pine spittle bug, White Pine weevil, Pales weevil, Pine leaf scale, and Pine bark aphid.

45.3 : 12.2 : 13.2 : 13.1. HANSON, H. S. **Observations on the life cycle of the Pine shoot beetles.** *Scot. For. J.* 54, 1940 (64–79).

It is stated that *Myelophilus piniperda* has only one generation a year, although two broods are of frequent occurrence. The life cycle of *Myelophilus* is shown to be very variable. Four slightly different types are described and reference is made to the circumstances under which each type may occur. It is pointed out that Pine beetles are normally controlled by various combinations of ecological factors, but outbreaks may arise when favourable conditions for increase are provided. Local outbreaks are invariably the result of negligence or mismanagement.

Expenditure on trapping adult insects is almost entirely waste. Control measures should be directed to the prevention of excessive increase in the bark-beetle population. *From author's summary.*

45.3 : 12.2 : 13.2. HANSON, H. S. **The prevention of outbreaks of the Pine beetles under war-time conditions.** *Bull. ent. Res.* 31, 1940 (247–51). [Imperial Institute of Entomology.]

A brief description of the life cycle of *Myelophilus piniperda* and of the damage caused by this species and *M. minor*, and of certain measures for the control of these beetles. To prevent bark-beetle infestation, cutting should begin in August and extraction should be completed by the end of March if possible. Felled timber left in the woods after the end of April should be barked. The increase of the Pine weevil (*Hylobius abietis*) can be checked to some extent by barking the Pine stumps while larvae are developing before they pupate.

45.3 : 12.2 : 13.2. MELIS, A. Contributo alla conoscenza del Bombice del Pino (*Dendrolimus pini* L.). **[A contribution to the knowledge of the Pine Lasiocampid.]** *Redia* 26, 1940 (73–175). [It.] R.A.E. A28 (505–6).

*Dendrolimus pini* is not common in Italy, but in 1937–8 an outbreak occurred in a forest

of about 200,000 trees, mostly species of Pine but also including some Cypress and other trees, on the island of Lussin in the northern Adriatic. By March, 1938, about 60,000 Pines had been completely defoliated and others were variously injured. The larvae attack most species of *Pinus*, but not *P. pinea*. Larch and some varieties of Cypress are sometimes attacked. The injury can be severe, and Pines may be killed if complete defoliation is followed by a very dry season or if infestation is heavy in two succeeding years. Weakened trees are often attacked by Scolytids, particularly *Ips erosus* Woll. Owing to different hibernation habits in this locality, adhesive bands could not be used, and spraying was impracticable. Control measures included the collection of eggs, larvae, and pupae, which were placed in cages to allow parasites to emerge, and the capture and destruction of adults by light traps, or by shaking the trees in early morning. The total number of all stages destroyed in 1938–9 was over 2 million. Infestation was much reduced after this campaign. The life history of the moth is described and an account is given of its natural enemies.

45.3 : 12.2 : 13.2 (41.1–4). CAMERON, A. E. **The Pine-bud tortrix moth in Aberdeenshire.** *Scot. For. J.* 54, 1940 (80–2).

The occurrence of *Evetria turionana* is reported from Huntly, Aberdeenshire. The life-cycle, economic importance, and control of the insect are discussed.

45.3 : 12.2 : 13.2. HRISAFI, C. P. Contribuţiuni la sistematica şi biologia coleopterului *Galerucella luteola* Müll. [**Contributions to the taxonomy and biology of the Elm leaf beetle, *Galerucella luteola* Müll.**] Bucarest. 1940. pp. 85. [Rum.g.] R.A.E. A29 (12–3).

A detailed account of the life history, habits, morphology, and natural enemies of *G. luteola* in Rumania.

45.3 : 13.2. GÄBLER, H. Prüfing neuer Bestäubungsmittel gegen Nonne und Nematus im Laboratoriumsversuch. [**Laboratory tests of new contact dust insecticides against *Lymantria monacha* and *Lygaeonematus pini*.**] *Thar. forstl. Jb.* 91, 1940 (94–112). [G.] Biol. Abs. 14 (15443).

'Forststäubol I' (a pyrethrum/derris mixture) was effective only against young larvae of *Lymantria monacha* but killed larvae of *Lygaeonematus pini* at all ages, though less quickly than 'Forststäubol II and III' (compounds of dinitro-o-cresol, and arsenic, respectively) and 'Effusan' (toxic constituent unknown), which killed both types of larvae at all ages. Both 'Forststäubol II' and 'Effusan' burnt the foliage.

## 5. MENSURATION. INCREMENT. YIELD

### 52. MEASUREMENT OF TREES

52.4 : 12.2. SCHNUR, G. L. **Volume table for Sugar Maple (*Acer saccharum* Marsh.)** *Tech. Note Allegh. For. Exp. Sta.* No. 28, 1940. p. 1.

The volume of the entire stem less bark in cubic feet. Particularly applicable to Allegheny Plateau in north-western Pennsylvania.

52.4 : 12.2. SCHNUR, G. L. **Volume table for Beech (*Fagus grandifolia* Ehr.)** *Tech. Note Allegh. For. Exp. Sta.* No. 29, 1940. p. 1.

The volume of the entire stem less bark in cubic feet. Particularly applicable in north-western Pennsylvania.

52.4 : 12.2. KALLAY, A. Gyors fatömegbecslés akácállomanyokban. [**Rapid estimation of the volume of Black Locust stands.**] *Erdész. Lap.* 79, 1940 (483–7). [Hu.g.f.e.]

The proposed formula:

$$F = \cdot 4m^2 + \frac{k}{10},$$

where $F$ is the volume of the stand, $m$ its average height, and $k$ its age, is claimed to allow of estimates that differ by not more than 7 to 8 per cent. from those obtained with Fekete's yield tables.

### 57. RATE OF GROWTH. YIELD. INCREMENT AND YIELD TABLES

57 : 04 : 07.7. REINEKE, L. H. **Permanent sample plot photography.** *J. For.* 38, 1940 (813–5). [Northeastern Forest Exp. Sta.]

A discussion of photographic faults, such as change in camera position and direction of view, which affect the utility of repeat photos taken to form a series. It is suggested that a definite

plan for permanent plot photographs and suitable technique and equipment for picture taking should be developed as a basis for better results with permanent plot photograph series.

57 : 12.2. BRIEGLEB, P. A. **Spruce-Hemlock forest shows prodigious growth.** *For. Res. Note Pacif. Nthwest. For. & Range Exp. Sta.* No. 31, 1940 (1–2).

Remeasurement of sample plots in a thrifty, well-stocked, even-aged Spruce/Hemlock stand, of average age of 89 years, showed a gross volume of 22,530 cu. ft. per acre or 129,700 bd. ft. (Scribner rule) per acre for trees 11·6 in. d.b.h. and larger, and a mean annual growth rate of 2·94 cords per acre for the whole stand or 1,457 bd. ft. (Scribner rule) per acre for the sawlog stand.

57 : 12.2. BRIEGLEB, P. A. **New data on Douglas-Fir saw-timber growth.** *For. Res. Note Pacif. Nthwest. For. & Range Exp. Sta.* No. 31, 1940 (3–4).

Data obtained from the records of permanent sample plots show: (*a*) An 84-year-old stand with a sawlog volume of 71,600 bd. ft. (Scribner rule) per acre and an average annual growth of 1,273 bd. ft. per acre for the past 30 years. (*b*) A 98-year-old forest on average site with a stand of 62,000 bd. ft. per acre and a mean annual increment of 633 bd. ft. which would have been increased 53 per cent. if material lost through mortality could have been salvaged earlier. (*c*) A 55-year-old stand on poor site quality III, with a sawlog volume of 23,200 bd. ft. (Scribner rule) and an average annual increment of 1,180 bd. ft. per acre for the past 10 years.

57 : 12.2. LAURIE, M. V., and RAM, B. S. **Yield and stand tables for Teak (*Tectona grandis* Linn. f.) plantations in India and Burma.** *Indian For. Rec. (n.s.) Silviculture* 4–A (1), 1940. pp. 115. [Forest Research Institute, Dehra Dun.]

This work contains the first comprehensive yield tables for Teak plantations throughout India and Burma, besides which a table of top height by site quality and age, stand tables, espacement tables by age and site quality and by average crop diameter, and curves illustrating various stand data, are also included. The introduction deals with the basic data and the compilation of the tables, and discusses practical applications. In the appendix are reproduced von Wülfing's yield tables for Java Teak plantations, as converted by H. G. Champion to English units of measurement.

57 : 24.25 : 11.15 : 65. ŠROGL, K. Fysiologické základy varůstu lesního porostu. Pojem zakmenění. **[Physiological basis of growth of stands. The concept of stocking.]** *Lesnická Práce* 19, 1940 (31–66). Biol. Abs. 14 (13934).

At any density of stocking the amount of light received by a given stand is the same, and thinning affects only the amount of light available for individual trees. Growth of the stand is more dependent upon site factors such as moisture, soil nutrients, and temperature, than upon light, and there is little difference in the volume growth of a stand at different intensities of thinning, provided that opening is not carried so far that the roots occupy only part of the ground space. Hence there is no optimum density of stocking, but stocking may vary within wide limits; thus a reduction of 20 per cent. in volume or basal area does not mean a corresponding reduction in current increment and may leave the total increment over the life of the stand entirely unaffected. Heavy thinning reduces the volume of the final cut but the loss is balanced by increased volume of intermediate fellings.

## 6. MANAGEMENT. WORKING PLANS. SURVEYS

6 : 94.3 (489). KISSIN, I. **Co-operation in Danish forestry.** *Quart. J. For.* 35, 1941 (12–8).

6 : 94.3 : 11.6. CHRIST, J. H. **Timber and cut-over land problems in the Pacific Northwest.** *Soil Conserv.* 6, 1940 (153–5, 164). [Soil Conservation Service, Spokane, Wash.]

Report on the foundation, in 1940, of the Forest Products Co-operative Association of the State of Washington, in Snohomish County, Wash. A special feature of this marketing association is that it commits its members to work their farm woods on a sustained yield

basis, and calls upon the Soil Conservation Service to give members technical guidance in the management of their woodlots.

6 : 97.2 : 94.3 (79.5). HARPER, F. B. **Clackamas farm forestry project.** *Timberman* 41 (12), 1940 (18–9, 62–5).

The first co-operative farm forestry project has been started in the Pacific Northwest, being authorized under the national Norris-Doxey co-operative farm forestry act of 1937.

6 : 94.3 : 33.32 : 33.0. HEYWARD, F. **Forest conservation program of the pulpwood industry in the South.** *Sth. Lumberm.* 161 (2033), 1940 (159–61). [Southern Pulpwood Conservation Association.]

A brief account of the activities of the Southern Pulpwood Conservation Association, which was founded by the pulp and paper industry in 1939 with the object of promoting conservation in non-company forests and thus assuring future pulpwood supplies. Members of the Association accept the obligation of adhering to minimum forestry practice rules. Propaganda for selective cutting, including field demonstrations, and the marking of improvement fellings by pulpmill foresters, are among the chief activites.

6 : 97.2 : 94.3. HALL, J. A. **Woodland management.** *Bull. Ohio agric. Ext. Ser.* No. 213, 1940. pp. 48. [Central States Forest Exp. Sta.]

A semi-popular bulletin on the characteristics and management of farm woodlands and the utilization of the forest produce. Intended primarily for the woodland owner in the lower Ohio valley.

## 61. SURVEYING. MAPPING. PHOTOGRAPHY

61. **Plotting the forest map from vertical air photographs.** Dominion Forest Service, Ottawa. Nov. 22, 1940. pp. 3.

A note on some methods that may be used in compiling maps for use in logging operations.

61. BUELL, J. H. **Abney level correction tables.** *J. For.* 38, 1940 (803–5). [Appalachian Forest Exp. Sta.]

Formulae and tables are given for use in converting slope distances to horizontal distances and conversely of converting horizontal distances to slope distances, when the slope is read in rise in feet per horizontal chain (topographic units on the Abney level), and distances are read in chains.

61 : 07.7. SEELY, H. E. **Notes on photogrammetric equipment.** Dominion Forest Service, Ottawa. 1940. pp. 5.

A brief discussion of the equipment used in the analysis of aerial photos and in the transfer of detail from photo to map. This includes the stereoscope and stereoscopic attachments, the duoscope, a photoelectric planimeter, and devices of use in base mapping and volumetric estimating from aerial photographs.

61 : 07.7. **The duoscope.** Dominion Forest Service, Ottawa. 1940. pp. 2.

A scientific instrument used in transferring details from air photographs to a map, the lines of sight of the eyes being directed separately, one eye to the map and the other to the photograph so that both are viewed simultaneously, thus permitting direct transfer and preventing errors. The instrument is portable, easily operated and does not require special artificial lighting.

## 63. ROTATION

63 : 12.2. HELLINGA, G. Een hernieuwd onderzoek naar den omloop van den djati (*Tectona grandis* L.f.). [**A renewed investigation on the rotation of Teak** (*Tectona grandis*).] *Tectona* 33, 1940 (507–64). [Du.e.]

For each of the two quality classes investigated (site quality 2·5 and 3·5), some 750 sample trees of different diameters were felled, and valued according to the timber assortments they yielded. Stand values in relation to age were then estimated using the price-size data thus obtained together with previously compiled yield tables [H. E. Wolff von Wülfing, *Tectona* 25, 1932 (1425–1509).] and an alinement chart which indicated the diameter-class distribution of a stand of a given mean diameter (as shown in the yield tables). For normal stands the rotation of the maximum net income was computed at 135 years for either site class. Since in practice most stands are abnormal, a correction factor will have to be introduced, which probably will tend to shorten the rotation. The financial rotation for normal stands was calculated at 65 and 60 years for site quality 2·5 and 3·5 respectively, assuming that

the rate of interest is 3 per cent. At a rate of 2 per cent. the corresponding rotations were 80 and 70 years.

63 : 74. CHAPMAN, H. H. **Comments on 'Rotations'.** *J. For.* 38, 1940 (790–1). [Yale School of Forestry.]

63 : 74. THOMSON, R. B. **Are similar results always obtained by use of soil rent and forest rent procedures?** *J. For.* 38, 1940 (792–3). [Duke School of Forestry.]

Both of these notes present a critical discussion of points raised in a previous article by R. S. Kearns [cf. *For. Abs.* 2 (163)]. After suggesting certain changes in the treatment of formulae and principles in this paper, the first note concludes that soil rent has a very limited application because of the lack of enthusiasm of owners and investors for denuded land, and the second concludes that only under a particular set of conditions would forest rent and soil rent procedures give similar results when used for the determination of rotations.

## 64. DESCRIPTION OF SITE. ASSESSMENT OF QUALITY

64 : 12.19.2. LINTEAU, A. Végétation et appréciation des qualités de station en forêt. **[Vegetation and the assessment of forest site quality.]** *La Forêt Québecoise* 2 (9), 1940 (36–45).

A review of the work of several investigations on the use of species of herbaceous vegetation for measuring forest site quality. The possibilities and limitations of this method are discussed, with particular reference to practice in Quebec.

64 : 12.19.2 : 56 : 12.2. KALELA, E. K. Mänty- ja kuusivaltapuiden kasvusta talvikkityypillä. **[On the increment of dominant Pine and Spruce trees of the *Pyrola* type.]** *Comm. Inst. for. Fenn.* 27 (6), 1938–9. pp. 43. [Fi.g.]

The *Pyrola* site-type (PyT) is characteristic of clay (Ton) soils in southern Finland. It is very rare, comprising only 0·2 per cent. (30–35,000 ha.) of the productive forest soils of the country. The stem-analysis data presented show that the height, diameter, and volume growth of dominant Spruces on PyT sites is much the same as on *Myrtillus* (MT) sites, while the growth of dominant Pines, from an age of about 40 years onward, is distinctly slower on PyT as compared with MT sites. Neither of these species grows better on PyT than on MT sites, although the ground vegetation of the PyT site resembles that of the rather more fertile *Oxalis-Myrtillus*. This is ascribed to the fact that the heavy clay of the PyT at times presents an unfavourable physical environment (poor aeration, excess of $CO_2$, etc.) to root growth.

## 66. POSSIBILITY. YIELD REGULATION

66 : 24.3 (74.8). EHRHART, E. O. **Practical aspects of silvicultural cutting.** *For. Leaves* 30 (6), 1940 (5, 13–6). [Armstrong Forest Co., Johnsonburg, Pa.]

Discusses in particular: (*a*) Successful co-operation of pulpwood cutters in working to a flexible diameter limit, the actual selection of trees being left to the cutter. (*b*) Increasing the period of employment of wood cutters by laying out an area for an individual or crew on which they complete the operation. (*c*) The value of semi-permanent roads in establishing accessibility.

66 : 22.15 : 76 (77.4–6). STODDARD, C. H. **The 'two-cut' system of forest liquidation in the Lake States region.** Charles Lathrop Pack Forestry Foundation, Washington, D.C. 1939. pp. 45.

The average life remaining to most of the timber-using concerns in this region is estimated at from 10 to 15 years. Chiefly for this reason, the application of the sustained yield principle to the exploitation of the forests of these concerns would involve too costly a readjustment. The 'two-cut' system, consisting of a selective cutting over a whole tract for a period of years followed by a complete liquidation cutting, is advocated as the only practicable alternative to destructive liquidation. Using operation data of a representative concern, an example is worked out showing that the two-cut system is financially attractive. At the same time, it leaves the land in a much better condition than clear-cutting does. [Cf. *For. Abs.* 2 (253).]

# 9. FOREST POLICY

## 90. GENERAL PRINCIPLES OF FOREST POLICY

90 (56.43). GRASOVSKY, A. J. **Forest policy in Cyprus.** *Emp. For. J.* 19, 1940 (219–25).

Forest policy is being directed towards the proper classification and use of land and the development of the forest for purposes other than production where these are believed to be of relatively greater importance. In promoting this policy the Forest Department is directly concerned with the welfare of the rural population. A brief description is given of the natural conditions, forest vegetation, forest problems, and management policy for each of the administration units.

The minor forests as distinct from the main forests refer to small scattered blocks of poor scrub found at lower elevations. Some of these have been transferred from the Forest Department to the District Administration without adequate arrangement for their protection, and severe damage has resulted. It is suggested that these forests should be left under the Forest Department with rural constables appointed to look after them.

Increase in population with a consequent increase in grazing and wood cutting for fuel requirements combined with the particular climatic and topographic features of Cyprus have favoured rapid soil erosion in many places. Various methods of direct control, and changes in some of the contributing industrial and agricultural practices, are being investigated by the Forest Department.

90 : 98.2 (73). JEWETT, G. F., COMPTON, W., and WOODS, J. B. **Before the Congressional Joint Forestry Committee in public hearings, Washington, D.C. January 16, 17, 1940. Statements in behalf of lumber and timber products industries.** National Lumber Manufacturers' Association, Washington, D.C. 1940. pp. 37.

## 91. BENEFICIAL EFFECTS AND ECONOMIC SIGNIFICANCE

91. HAKIMUDDIN, M. **The national wealth of the forest.** *Indian For.* 66, 1940 (724–32).

91 : 94.1 (73). **State forests for public use.** *Misc. Publ. U.S. Dep. Agric.* No. 373, 1940. pp. 36.

Includes the following tabular statements: (1) State forests and State forestry appropriations as shown in data supplied by State foresters, 1937–8; (2) expenditures for protection of State and private lands against forest fires during 1937; and (3) areas and costs of forest fire control, 1930 and 1938.

## 92. FOREST LAW

92 : 43.1 (71.1). BRITISH COLUMBIA. **Regulations (pursuant to the provisions of the 'Forest Act').** [British Columbia Forest Service, Victoria, B.C.?] No. 419, Apr. 12, 1940. pp. 4.

Mainly regulations concerned with protection against forest fires, to be observed in the first case in respect of all locomotives, engines, tractors and trucks operated in close season within ½ mile of any forest or woodland, and secondly in respect of all industrial or logging operations conducted under similar conditions.

## 94. OWNERSHIP, ACQUISITION AND ALIENATION

94.1 (498). GALERIU, I. Cumpărările de păduri de către stat în perioada 1910-40. **[Purchases of forest by the [Rumanian] State in the period 1910-1940.]** *Rev. Pădurilor* 52, 1940 (672–5). [Rum.f.]

94.1 (73). BROWN, N. C. **Community forests—a new idea in the American forestry program.** *Sth. Lumberm.* 161 (2033), 1940 (154–8). [New York State College of Forestry.]

The social and economic advantages of communal forestry are discussed. In 1940 there were 1,647 community forests in various stages of organization and development in the U.S.A. These forests ranged in size from a few acres in the case of small village and school district forests to over 66,000 acres in Seattle, Washington.

## 95. FOREST TAXATION. FOREST LOANS

95.1 : 43.1 (79.7). BRADLEY, R. L. **Forest taxation and protection in the State of Washington.** *Univ. Wash. For. Cl. Quart.* 14 (1), 1940–41 (13–5).

## 97. RELATION OF FOREST TO AGRICULTURE, PASTURE, AND INDUSTRY

97 : 96 (54). S[AGREIYA], K. P. **Report of the Soil Conservation and Afforestation Subcommittee of the National Planning Committee.** *Indian For.* 66, 1940 (733–9).

This report contains resolutions passed by the National Planning Committee, outlining its general policy regarding land use in India. The most conspicuous feature is a proposal to establish a statutory body to be known as the Land Development Board, whose functions would be directed to the improvement and proper co-ordination of land use. The Board would have a regional organization to decide on matters affecting individual provinces, and a central organization to settle questions of wider importance. The Central Land Development Board should deal with soil surveys, land reclamation, anti-erosion work, afforestation and forest improvement work, and the co-ordination of land use in general. Connected subjects such as irrigation and drainage, crop production, grassland management, marketing and industrial utilization of agricultural and forest produce would be dealt with in co-operation with other organizations. Other resolutions of the National Planning Committee deal with particular aspects of this general theme.

## 98. STUDY OF THE TIMBER MARKET

98 (485). Bränslekommissionen, dess uppgifter och något om påbörjad verksamhet. **[The Swedish Fuel Commission, its tasks and some notes on activities already begun.]** *Skogsägaren* 16, 1940 (132–7). [Sw.]

The Swedish Fuel Commission, which began work on July 1, 1940, is a State body charged with the task of controlling all fuels under the prevailing crisis conditions. Fuelwood prices have been fixed; an effort has been made to stimulate wood transport by reducing freight charges on both public and private railways over the period July 15—September 15; an inventory of all fuelwood was arranged to take place in August; rationing of consumers is beginning; and the fuelwood cutting programme for August 1—December 31, 1940, has been set at about 12 million cu. m.

# BOOKS

12.19.1 : 12.2 (91). CORNER, E. J. H. **Wayside trees of Malaya.*** Vol. I [text], pp. vii + 770; Vol. II [plates], pp. 228. Govt. Printing Offices, Singapore. 1940.

To appreciate the magnitude of the task tackled by the author it should be realised that in Malaya there are approximately 2,500 tree species distributed at the rate of a hundred species to the acre. Mr. Corner is to be congratulated on producing a comprehensive and attractive addition to the literature on Malayan flora, more especially as the price of the two volumes has been kept remarkably low ($10. Straits).

The text is contained in Volume I, while in Volume II all the commoner trees met with in cultivated and waste places have been illustrated in a series of excellent photographs.

As the author points out, the book is intended primarily for the amateur, and for this reason the early pages are given up to a general botanical discussion in non-technical language. This is followed by a description of the main types of vegetation in Malaya, and a section on trees of local interest. The second part of the book consists of a series of simple keys to the species and genera of the wayside trees of the country. Forest trees are not described owing to their number and to the difficulty of describing in detail their botanical structure. Altogether 950 species are described in Part III. Families are arranged in alphabetical order. Wherever possible the Latin, English, and Malay names are given. The author, in coining English names for several hitherto unnamed species, has shown considerable ingenuity, but it is an open question whether all his choices will meet with universal approval. Palms, cycads, bamboos, pandans, and tree ferns have been omitted: as these include many of the most graceful and attractive members of the wayside flora, in which the amateur is particularly interested, it is to be regretted that a description of them could not be incorporated in the present work. It is to be hoped that the author will soon be able to implement his suggestion that these groups can be dealt with more conveniently in another book.

Malayan foresters will surely be forgiven for registering two mild protests, firstly, against the statement on page 48 with reference to Kanching Forest Reserve, one of the best-known reserves in the country. The 'plantations' referred to by the author in reality consist of natural regeneration. The second complaint is that in the list of periodicals recommended as worthy of study no mention is made of the *Malayan Forester*.

Criticism of a work of such wide scope is easy, however, and the above remarks are in no way intended to detract from its value, both to the practical forester and to the general public.

A. R. BARRIE.

01. TRELOAR, A. E. **Elements of statistical reasoning.** John Wiley & Sons, Inc., New York: Chapman & Hall, Ltd., London. 1939. pp. 261.

The recognition of the value of statistical method in the analysis of quantitative data is now almost universal, so that no work into which the examination of such data enters, can be considered satisfactory unless a proper statistical examination has been made. The forester is unavoidably concerned with quantitative data, and, thus, also unavoidably a statistician of sorts, whether he will or no. All that remains to be decided is whether he shall be a good or bad statistician and here, obviously, Schools of Forestry have a considerable responsibility, for the statistical soundness of future generations of foresters largely depend upon them.

One great difficulty in statistical education is that most of those receiving it are elementary mathematicians and will never become, from the mathematical standpoint, more than elementary statisticians. How, then, shall one use the all too brief period which is usually available for their statistical training. There are two courses open to the teacher: he may attempt to train the student to think statistically, from first principles, so that a proper understanding of problems may be obtained and an ability to choose the most appropriate methods of analysis developed, or he may lay the major stress on the actual method as a technical tool for the solution of a particular type of problem, aiming to make the student efficient in the use of this tool even if he has no adequate understanding of the reasons which make it appropriate. The book under review will appeal to

* Referenced in *For. Abs.* 2 (261).

those who take the first course, for it provides, as its title indicates, an introduction to the elements of statistical reasoning. As such, it is a most welcome addition to the more elementary text-books concerned with statistics and may be commended to all foresters who wish to obtain a basic understanding of statistical principles and reasoning rather than merely to be competent to work out various methods of analysis.

In this work the author is concerned solely with the analysis of large samples. Small sample techniques and also the special methods for analysis of variance necessary for much biological research work are not dealt with. The study of these should, however, rest upon a satisfactory foundation which can only be laid by a fundamental grounding such as will be obtained by those who follow this book. It has to be remembered, also, that most foresters are administrators and not specialist researchers and are, therefore, more in need of an understanding of general principles than of a detailed knowledge of special methods of analysis.

Very satisfactory features of this book are the clarity of the argument and the care taken to enable the student to understand the algebraic derivation of formulae, in so far as this is possible in an elementary book. Much is done, in fact, to enable the student to acquire interest in, and receive illumination from, this essentially mathematical subject. In its general scope the book is concerned with the analysis of univariate and bivariate systems and with their sampling errors; with propartives and probability and the sampling errors of propartives and with the measurement of frequency discardance and the analysis of independence and bivariate tables of frequency. Adequate tables are given in the appendices for the use of students.

The author is to be congratulated on a very satisfactory, clearly developed and useful work.

W. R. Day.

# NOTES FROM ANNUAL REPORTS

Reports examined include: *Bombay*: Forest administration report for the year 1939–40. *British North Borneo*: Forests [Annual report on], 1939. *Canada*: Silvicultural research operations, 1939–40 (*Silvic. Res. Note Dom. For. Serv.* No. 64, 1940. pp. 42.) *Central Provinces and Berar*: Report on forest research, 1939–40; Pt. I. *Iowa*: Agricultural Experiment Station, Iowa State College of Agriculture & Mechanic Arts: Report on agricultural research for the year ending 30th June, 1939; Pt. I. *Jammu and Kashmir*: Progress report on forest administration for the Fasli year 1995–96 ending 30th Assuj, 1996 [16th October, 1939]. *Manitoba*: Annual report of the Forest Service, fiscal year ending 30th April, 1940. *Mauritius*: Annual report of the Forest Department for 1939. *Michigan*: Tenth biennial report, 1939–40, the Department of Conservation. *Queensland*: Annual report of the Director of Forests for the year 1939–40. *South Carolina*: Report of the State Commission of Forestry for the year 1st July, 1939 to 30th June, 1940. *United Provinces*: Report on forest utilization for 1939–40 (*Bull. U.P.For. Dep.* No. 18, 1941. pp. 16). *Victoria*: Twentieth annual report of the Forests Commission for the financial year, 1938–9. *Western Australia*: Report on the operations of the Forest Department for the year ended 30th June, 1940.

The numbers in brackets indicate the pages of the reports to which the annotations refer.

## SILVICULTURE

**Bombay.** Experiments in the reproduction of Bamboo by layering and cuttings showed a high percentage of survival at the end of the first year (32). Root and shoot cuttings of *Cassia siamea* established themselves successfully (33).

**Canada.** Colchicine treatment of seeds of species of Spruce, Pine and Poplar appears to induce chromosome doubling (10). Cuttings of Norway Spruce taken and planted in mid-November survived the winter in outdoor propagating frames and produced roots and new shoots in the following summer. Treatment of the cuttings with talc containing 5,000 p.p.m. of indolyl-acetic acid increased rooting from less than 50 per cent. to more than 80 per cent. and rooting was also improved by the addition of peat humus to the sand (11–2). The girdling of Wire Birch and Red Maple 3 ft. from the ground in January resulted in the minimum amount of sprouting as compared with other methods tested in New Brunswick (22). Preliminary results in Alberta indicate that fall sowing of White Birch gives better results than spring sowing while the opposite is true for Spruce and Douglas Fir (38).

**Central Provinces and Berar.** It is reported from Bhandara that seedling reproduction of the scattered Teak growing in mixed forests is improved by shrub cutting (1). Factors favourable to Sal regeneration, as reported from Balaghat, are a good seed year, early break of monsoon, and a few late showers. In frost-free forests clear felling gives satisfactory Sal regeneration whereas extensive opening of the canopy is harmful to regeneration in frost-liable forests and a shelterwood is maintained (1, 3–5, 36).

**Iowa.** The use of a transplant trencher attached to the tractor frame in place of a plough for furrow preparation increased transplanting efficiency (151). Sowing the seed of Western Yellow Pine, Scotch Pine, Austrian Pine and Jack Pine at a reduced density resulted in seedlings large enough to transplant as 1-year plants (152). Jack Pine requires either mycorrhizae or fertilization in order to grow on a very poor soil. Within limits, mycorrhiza appears to take the place of fertilization in supplying phosphorus and possibly nitrogen. Soil and duff from White Pine plantations will inoculate Jack Pine, Scotch Pine, Northern White Pine, Virginia Pine, Japanese Red Pine and Ponderosa Pine with mycorrhizae. It was found that tree seedlings (Jack Pine and Red Oak) on poor soil responded to phosphorus fertilizer and to a less degree to nitrogen, while the opposite was true for oats, thus indicating a difference in the requirements of the two types of plants (153–4).

**Jammu and Kashmir.** Observations indicate that natural regeneration of Kail (*Pinus excelsa*) requires a long time and it is possible that seed production by seed trees of this species and Deodar (*Cedrus deodara*) is reduced by the sudden shock of isolation (17–8).

**Mauritius.** The desirable hardwood mixture of *Tabebuia pallida*, *Swietenia mahagoni* and *Cassia siamea* appears to be achieved by planting pure *Cassia*, thinning heavily at 3–4 years and underplanting the other species (7).

**Queensland.** Seed of Hoop Pine (*Araucaria cunninghamii*) has been kept in cold storage for 3–4 years with practically no loss of viability, and cold storage of southern Kauri Pine (*Agathis*

*robusta*) seed is also proving successful. Spacing experiments with Hoop Pine show a trend in both height and diameter increment, varying with the space allotted the individual tree. Repeated experiments show that regrowth, following the coppicing of malformed stems of *Eucalyptus paniculata*, has no better form than the parent stem. Minimum $P_2O_5$ requirements of *Pinus taeda* and *P. caribaea* have been determined. The quality of water used in nurseries may have a bearing on the development of chlorosis in Hoop Pine, in which case frequent application of sulphur or neutralizing the water before application are the treatments indicated (4).

**Western Australia.** Applications of zinc and superphosphate are effective remedial treatments for sick Pines (*Pinus radiata* and *P. pinaster*) in established plantations (15).

## EXTRACTION, UTILIZATION AND MARKETING

**Bombay.** A wood preservative known as 'Cuprex' prevented the decay of Teak and Kindal (*Terminalia paniculata*) that were buried 1 ft. underground for a period of one year (33–4).

**British North Borneo.** The volume of timber cut from licensed areas totalled 7,074,346 cu. ft. (1).

**Central Provinces and Berar.** The Australian variety of *Prosopis juliflora* germinates and grows well on poor soils, is immune from browsing, and has a close-grained wood that should do for fuelwood and poles (20).

**Jammu and Kashmir.** The sale of poor, malformed trees along with the major coupe at a lump-sum price has been successful as a means of disposing of material which would not be marketed in the usual way, and of improving the general condition of the forests (15, 31).

**Manitoba.** The lumber cut during the year totalled 30,042,000 bd. ft. (10).

**United Provinces.** Tests have shown that ulla grass is suitable for the manufacture of packing and wrapping paper, and it is best used without admixture of other pulps. The yield is one ton of paper for every 2½ tons of grass used. Chir Pine pulp is also suitable for paper manufacture (13).

## PROTECTION

**Bombay.** With the object of checking erosion and conserving sub-surface soil water a number of areas on bare hillsides have been treated experimentally along the lines of the Gradoni system. Bunding was particularly successful in stopping erosion in one area (12).

**Central Provinces and Berar.** Experimental data indicate that under certain conditions annual controlled early burning on areas bearing dense *Imperata* grass and from which slash has been removed, can be started two years after clear felling without causing much damage to coppice regeneration of Teak or Lendia (*Lagerstroemia parviflora*) (35).

**Mauritius.** Two fungi, *Geotrichum candidum* and *Haplographium* sp. (sp. nov.), which are parasitic on *Calophyllum tacamaka* have been isolated and their pathogenicity proved (6).

**Victoria.** Experience proves that Pine plantations, particularly those of older age classes in which thinning and pruning operations have been carried out, are not in themselves a high fire hazard (19). Experiments show that small, portable, two-way radio sets are highly efficient for forest communication (23). The scarab beetle (*Anoplognathus chloropyrus*) is reported as causing severe defoliation of Red Gum (*Eucalyptus tereticornis*), *E. bosistoana* and other Eucalypts (25).

**Western Australia.** A revolving broom drawn behind a runabout is a relatively efficient means of removing leaves and debris from tracks as a fire-preventive measure (13). Investigations show that the use of duff hygrometers and Piche evaporimeters gives no better indication of degree of fire hazard than does the variation in moisture content of wood cylinders (14).

## ECONOMICS, MANAGEMENT AND POLICY

**Canada.** Yield tables are being prepared for Spruce and Jack Pine for use in estimating stands from aerial photographs (33). Average diameter has been found to be a satisfactory measure of site value for even-aged fully stocked stands of Lodgepole Pine (40).

**Michigan.** The first farm forestry demonstration project, as authorized under the Norris-Doxey law of 1937, was started (305–6).

**South Carolina.** Any landowner may have his forest property examined and reported on by a technical officer as to the best method of managing his woodland and utilizing his forest products 52–4).

# NOTES FROM THE DAILY AND THE NON-TECHNICAL PRESS

References: 1. *The Age*, Melbourne. 2. *Alcázar*, Madrid. 3. *B.B.C. Daily Digest*, London. 4. *Evening Post*, Wellington. 5. *Messager d'Athènes*, Athens. 6. *Nouvelle Revue de Hongrie*, Budapest. 7. *Politika*, Belgrade. 8. *Pueblo*, Madrid. 9. *Taranaki Daily News*, New Plymouth. 10. *Ya*, Madrid. The numbers in brackets indicate the reference number and the date of publication of the newspapers to which the annotations refer.

**Australia.** Forest industry protection regulations and general fire-lighting regulations under the Forestry Act have now been approved by the Executive Council. The former provide that persons managing sawmills or other undertakings in the forests must install fire-fighting equipment specified by the Forests Commission, keep it in order, and give forest officers the right to inspect it and to make it available to forestry employees. Mills must install telephone communication to terminals specified by the Commission. All dead and standing timber and other inflammable material must be cleared two chains from a mill or any building or residence. Millers must provide a water supply, with a reserve of 3,000 gallons, in overhead tanks or a reservoir of sufficient altitude to provide a stream of at least 30 ft. from a half-inch nozzle at the end of 100 ft. of hose. Hydrants must be installed so that the spray is effective at all sections of the mill. Burning of edgings and waste must not be done in the open unless approved by the Forests Commission, and must be done in a pit so that the waste is kept 1 ft. below the banks. In the proclaimed danger period no such burning will be allowed except between 4 p.m. and 7.30 a.m. General fire-lighting regulations provide conditions for fires in the open for cooking or other domestic purposes during the bush-fire proclamation period. The burning off of stubble is not to commence before 4 p.m., when the temperature of the air must not exceed 90 degrees; moreover, there must be no more than a light breeze blowing. Either a firebreak 15 ft. in width or two breaks of 5 ft. width 5 ft. apart must be ploughed around the paddock. At least three men, with adequate fire-fighting equipment, must be present at the fire, which must be extinguished at sunrise. Notice in writing of intention to burn off must be sent to occupiers of adjoining land, and where the stubble is within one mile of a State forest, the Forests Commission must be informed. Similar conditions are imposed regarding burning of firebreaks on grass lands (**1**; 29.10.40).

**Greece.** From an article on the Greek forests and their utilization:—During 1939, which was the first year of proper functioning of the newly created Forest Service, considerable sums were invested in the construction of forest roads, totalling 125 km., and of houses for forestry personnel, and in the purchase of lorries and other machinery. Lorries driven with charcoal gas were used for the first time in forestry work. About 1,000 ha. of bare land were afforested in the course of the year by the Forest Service, and about 500 ha. by the Macedonian Hydrological Office (Caisse de Travaux Hydrologiques de la Macédonie).

Exports of forest products increased from Dr. 288,015,049 in 1938 to Dr. 382,859,235 in 1939, while imports decreased from Dr. 616,375,869 to Dr. 551,879,191. (Exchange approximately 520 Drachmae = £1.) The increase in exports was due to a larger production and exportation of spirits of turpentine and of colophony.

The most recent estimates of forest areas by classes of ownership are given as follows: State forests, 1,207,343 ha.; private forests, 422,732 ha.; communal forests, 108,010 ha.; convent forests, 88,135 ha.; and co-operative forests, 91,760 ha. Total, 1,917,980 ha., or about 12 per cent. of the land area of Greece (**5**; 24.11.40 and 26.11.40).

**Hungary.** From an article on the economy of Transylvania:—The forest resources of Northern and Southern Transylvania amount to 1,690,000 and 1,595,000 ha., respectively. Forest devastation during recent years has been particularly severe in the northern part of the province: according to Rumanian statistics, the forest area of that region has been diminished by 152,000 ha. during 1929–38. The corresponding figure for the south of the province was only 24,000 ha. The greater depletion in the north was due to the greater capacity of the sawmill industry in that region, and this, in turn, is partly explained by the larger proportion of Pine forest to total forest area in the north (one-third, as against one-sixth in Southern Transylvania). The sawmill industry in Northern Transylvania

comprises 205 factories, commands a total power of 20,842 C.V. (one chèval = 0·9863 English horse-power), and employs 14,276 men. The corresponding figures for Southern Transylvania are: 193 factories, 13,384 C.V., and 5,747 men (**6**; October, 1940).

**New Zealand.** An intensification of the campaign for preventing and combating forest fires during the dry months is to be undertaken this season. Under the new regulations, forest officers are given power to enter private lands for the suppression of fires where State forests or fire districts are endangered. Engines of all kinds operating in State forests or fire districts from 1st August to 30th April must be equipped with spark arresters, and in addition, steps must be taken to prevent the escape of fire and live coals from ashpans and fire boxes and for the disposition of ashes in such a manner as to prevent the outbreak of fire. Certain relaxations are granted to milking machines and shearing plants. The Director of Forestry may, during periods of extreme fire danger, suspend logging or sawmilling operations by notice over the radio or otherwise. Provision is made for right-holders—the holders of State forest privileges—to suppress outbreaks of fire and arrange for the nearest forest officers to be notified of the outbreak. A rightholder must provide and maintain fire-fighting equipment in places readily accessible for use. Another provision makes it an offence for any person to throw or drop any kind of smouldering substance in a State forest or fire district from 1st August to 30th April. It has been made an offence to enter a State forest or any exotic forest in a fire district without a permit, and likewise the non-observance of the conditions of a permit has been made an offence. It has been made compulsory for the owner or occupier of land adjoining a State forest or in a fire district to notify the nearest forest officer in the case of outbreak of fire and to use every endeavour to control it till his arrival. Similarly, any person engaged or employed in a State forest or in a fire district shall, on discovering an outbreak of fire, advise the nearest forest officer and immediately leave his own work to fight the fire. As an extension of this principle, any person who discovers a fire burning unattended in a State forest or fire district has the same obligations as a person engaged or employed in a State forest. Thus, for the first time in the Dominion the responsibility is placed on every person who works in or adjacent to a State forest or a fire district or happens to be within those areas for any purpose whatsoever to attend to and control forest fires (**4**; 28.9.40).

According to a communication addressed by the Minister of Lands to the South Taranaki Executive of the New Zealand Farmers' Union, consideration is now being given to the formation of comparatively small forest units in provinces located some distance from the major forests of the Dominion in order to supply local requirements without excessive freight charges (**9**; 30.11.40). In discussing the Minister's communication, it is pointed out that the employment of ex-service men on such schemes will be facilitated if men are given the opportunity to work in their own districts (**9**; 2.12.40).

**Spain.** As part of its afforestation programme, the Spanish State is buying up all private land situated in the Sierra de Espuña, Murcia, with a view to planting it up with Pine. The State owns some 9,000 ha. of mostly mature Pine plantations in this Sierra. During 1940 some 12 million trees have been planted, a figure that it is proposed to double in 1941. At present, over a thousand men are employed in this region on afforestation and the construction of forest roads and of houses for forest guards (**2**; 28.10.40 and **8**; 28.10.40).

The 200 million Pesetas credit scheme for the relief of agriculture in regions devastated by the civil war includes provision for loans for afforestation as a means of relieving rural unemployment. (Exchange during 1937, 69 to 90 Pesetas = £1) (**10**; 6.11.40).

**U.S.S.R.** According to a broadcast from Moscow, a Soviet engineer has successfully terminated his experiments in hardening the timber of conifers. Softwoods treated by the new method become harder than Oak, and can be used for the same purposes as hardwoods, but in some cases they even replace metals. The method is reported to be very simple and cheap (**3**; 29.1.41).

**Yugoslavia.** At present the State forests of Bosnia are exploited chiefly by lease-holding companies. It is suggested that the State should take over the utilization of these forests so as to end devastation, increase the revenue, and provide more employment to the local population through more intensive management (**7**; 27.10.40).

# LIST OF ADDITIONAL ABBREVIATIONS

(Based on the *World List of Scientific Periodicals*)

| | |
|---|---|
| *Anthrac. Surv. Pap. Allegh. For. Exp. Sta.* | Anthracite Survey Paper. Allegheny Forest & Range Experiment Station. Philadelphia. |
| *Bull. Bartlett Tree Res. Lab.* | Bulletin. Bartlett Tree Research Laboratory. Stamford, Conn. |
| *Bull. Mass. agric. Exp. Sta.* | Bulletin. Massachusetts Agricultural Experiment Station. Amherst. |
| *Bull. Ohio agric. Ext. Serv.* | Bulletin. Ohio State University Agricultural Extension Service. Columbus. |
| *Bull. Qd. For. Serv.* | Bulletin. Queensland Forest Service. Brisbane. |
| *Circ. Kans. agric. Ext. Serv.* | Circular. Kansas State College of Agriculture and Applied Science Extension Service. Manhattan. |
| *Comm. Inst. for. Fenn.* | Communicationes Instituti Forestalis Fenniae. Helsinki. |
| *Gdns'. Bull.* | Gardens' Bulletin. Straits Settlements. Singapore. |
| *J. Amer. Soc. Agron.* | Journal of the American Society of Agronomy. Washington. |
| *J. Aust. Inst. agric. Sci.* | Journal of the Australian Institute of Agricultural Science. |
| *Leafl. For. Prod. Res. Lab.* | Leaflet. Forest Products Research Laboratory. Princes Risborough, Bucks. |
| *Malay. For. Rec.* | Malayan Forest Records. Kuala Lumpur. |
| *Occ. Pap. Allegh. For. Exp. Sta.* | Occasional Paper. Allegheny Forest Experiment Station. Philadelphia. |
| *Proc. Soil Sci. Soc. Amer.* | Proceedings of the Soil Science Society of America. Ames, Iowa. |
| *Rur. Res. Ser. Mon. Tenn. agric. Exp. Sta.* | Rural Research Series Monograph. Tennessee Agricultural Experiment Station. Knoxville. |
| *S. Afr. Sug. J.* | South African Sugar Journal. Durban. |
| *Tech. Bull. Minn. agric. Exp. Sta.* | Technical Bulletin. Minnesota Agricultural Experiment Station. St. Paul. |
| *Tech. Note Allegh. For. Exp. Sta.* | Technical Note. Allegheny Forest Experiment Station. Philadelphia. |
| *Tech. Note For. Prod. Lab., Wis.* | Technical Note. U.S. Forest Products Laboratory, Madison, Wis. |
| *Trans. Conn. Acad. Arts Sci.* | Transactions of the Connecticut Academy of Arts & Sciences. New Haven. |

Libraries, other than that of the Imperial Forestry Institute, from which literature was obtained for purposes of recording and abstracting in the present number of *Forestry Abstracts:*

| *Designation*: | *Library of*: |
|---|---|
| H.S.B. | The Imperial Bureau of Soil Science, Harpenden, England. |
| K. | The Royal Botanic Gardens, Kew, Surrey. |
| L.C.S. | The Chemical Society, London. |
| L.S. | The Science Library, London. |
| O.B.D. | The Department of Botany, Oxford. |
| O.R.E. | The School of Rural Economy, Oxford. |
| P.R. | The Forest Products Research Laboratory, Princes Risborough. |

Abstract and reference journals referred to in this number:

(1) *Publications of the Imperial Agricultural Bureaux*:

| | |
|---|---|
| Hort. Abs. | Horticultural Abstracts, East Malling, Kent. |
| Pl. Breeding Abs. | Plant Breeding Abstracts. Cambridge. |
| R.A.M. | Review of Applied Mycology. Kew. |
| R.A.E. | Review of Applied Entomology. London. |
| S. & F. | Soils and Fertilizers. Harpenden. |

(2) *Other publications*:

| | |
|---|---|
| B.C.P.A. | British Chemical and Physiological Abstracts. London. |
| Biol. Abs. | Biological Abstracts, Baltimore, Md. |
| Chem. Abs. | Chemical Abstracts. Easton, Pa. |
| Fuel Res. Summ. | Fuel Research Summary. East Greenwich, London. |

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